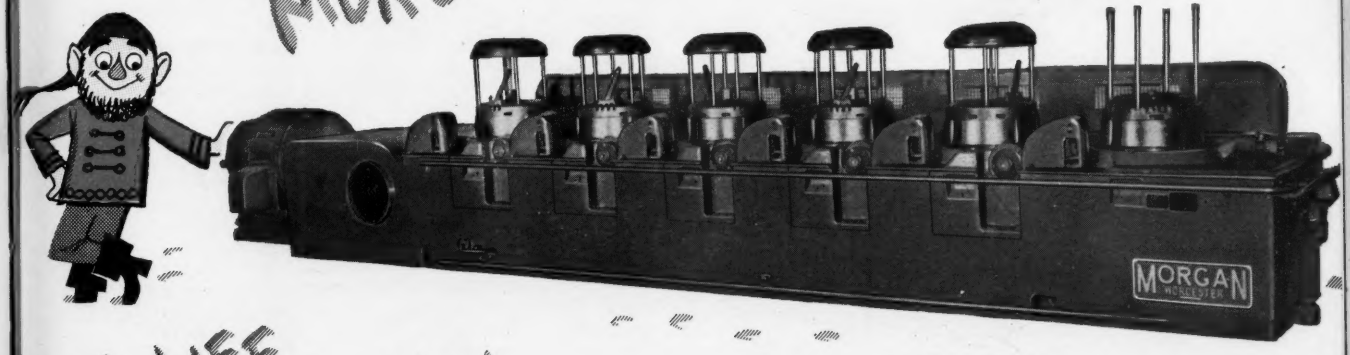
WIRE AND WIRE PRODUCTS

NORTH POLE

DECEMBER 1953

MERRY CHRISTMAS FROM MORGAN CONNOR



LONG LIFE
ECONOMY
RELIABILITY
FLEXIBILITY
EFFICIENCY
FAST AND COOL

79

MORGAN CONSTRUCTION CO., Worcester 8, Mass.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

What has got to do with the price of bolts?

These past few years the cost of almost any item you mention has skyrocketed when compared with standard prices of a decade ago. The nickel, they say, is useless, and the penny a downright nuisance.

By common standards (higher labor and material costs) the price of bolts should probably have doubled over the past ten years, yet they have remained virtually stable.

It wouldn't take you long to trace the reason for this stability to improved production methods that enable bolt makers today to produce thousands in the time it formerly took to make only a few hundred. Cold heading and threading a bolt now require but a fraction of a second. But the machine that performs this miracle must have steel of just the right temper and structure. Annealing is all-important because it is through the annealing that the necessary "spheroid" structure is obtained. Getting this particular structure requires extreme accuracy and control and unvarying uniformity of heat. This is possible easiest, through Lee Wilson Single-Stack Radiant Tube Annealing Furnaces, and that's why more wire and rod fabricators use Lee Wilson furnaces than all other makes combined.

Lee Wilson

ENGINEERING Co., Inc.

20005 WEST LAKE ROAD • CLEVELAND, OHIO

Telephone ED-1-6600

WHAT DOES FIRTH STERLING OFFER YOU?

(ANSWER NUMBER 1)

NEW METALS FOR AN ATOMIC AGE

"PIONEERS OF THE *UN*COMMON" IN METALLURGY

For 64 years we have been pioneering in the research, development and production of special purpose steels and, more recently, powdered metals.

Not content to become just another tonnage producer of established grades, Firth Sterling has successfully paced the field in *anticipating* the requirements of science and industry, so that the exactly *right* metal is *ready* when a new need arises.

Now, in an era of jet engines and atomic power, Firth Sterling *has* the necessary high temperature alloys and cermets, Firth heavy metal, chromium carbides, zirconium alloys, and stainless specialties . . . as well as both new and conventional grades of high speed steels, tool and die steels, and sintered tungsten carbides.

To accomplish this metallurgical preparedness, research at Firth Sterling had to be expanded several fold. The best of new American and European processes and equipment were blended into integrated production facilities. The metallurgical brains of the world are "picked" regularly by consultation with Firth Sterling's international panel of renowned scientists and engineers.

The job is done, for today, yet *even* today we are already working on the metallurgical needs of tomorrow.

Your inquiries are invited.

Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future

C.H.Q. DIE STEEL

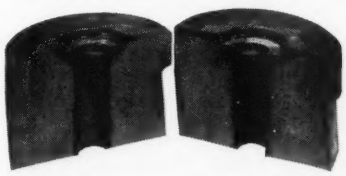
hangs up... **ANOTHER COLD HEADING RECORD IN COMPARATIVE TESTS!**

A nationally known fastener manufacturer* recently made comparative tests of solid steel cold heading dies, under carefully controlled conditions, producing ⅝" square head machine bolts from 1020 steel on a Waterbury Farrel double stroke automatic.

Firth Sterling C.H.Q. came off with top honors and the highest production ever

C. H. Q. solid die after 192,000 run.

obtained by this manufacturer from any steel die . . . 192,045 both ends. (78,860 one end, 59 Rockwell C; 113,185 other end, 61 Rockwell C). Standard competitive carbon steel dies produced only 50,000—60,000 both ends and ultimately failed by cracking axially. The C.H.Q. die wore oversize but longitudinally etched



Longitudinally etched section reveals no cracks.

section revealed not even a hair line crack.

Ask for technical literature on C.H.Q.—or a Firth Sterling representative will discuss your die problems. His recommendations are unbiased . . . we make and sell *both* steel *and* carbide for every tooling need.

*(name on request)

P-10

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

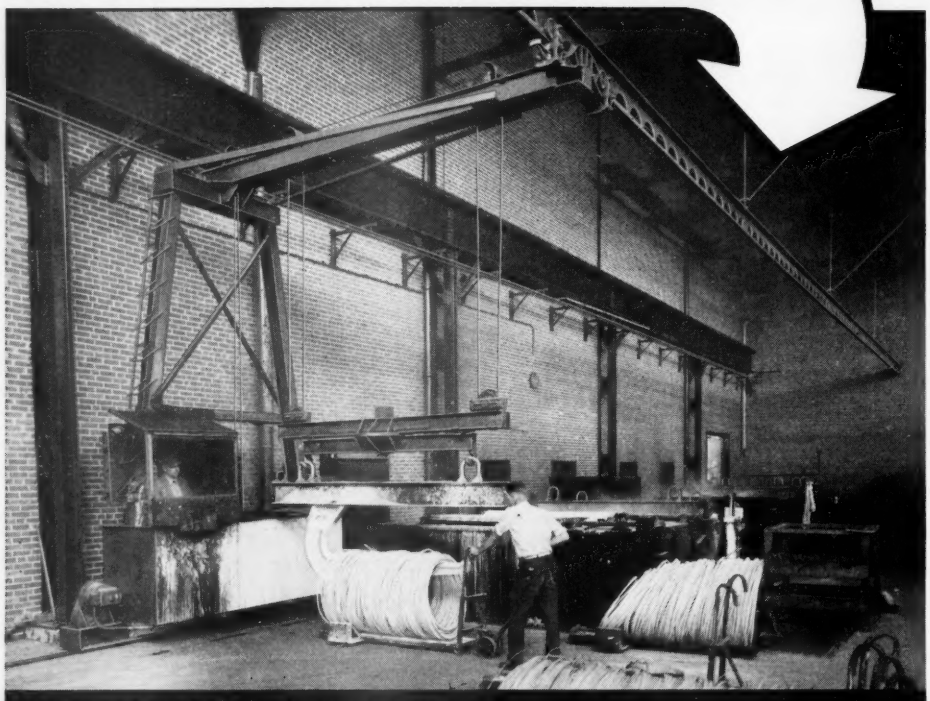
OFFICES* AND WAREHOUSES: BIRMINGHAM* CHICAGO CLEVELAND DAYTON* DETROIT HARTFORD HOUSTON* LOS ANGELES NEW YORK* PHILADELPHIA* PITTSBURGH* WASHINGTON*

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets

CUT ROD AND WIRE CLEANING COSTS

THE CLEVELAND TRAMRAIL WAY

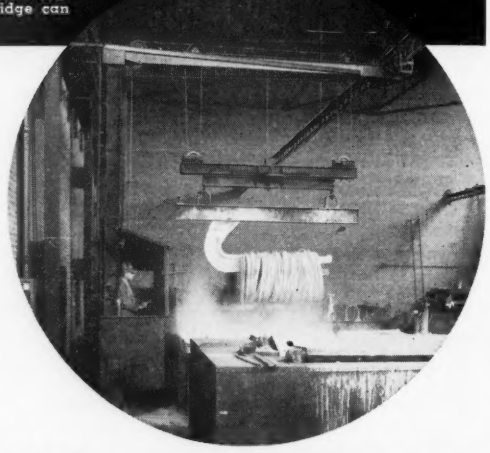


Hoisting machinery for this gantry crane is located next to operator's cab where protected from acids and fumes. Variations of this equipment have been built to suit special conditions. If desired, a movable trolley on gantry bridge can be furnished.

Nothing else that we know of can so cut costs and bring about other important advantages in a rod or wire mill, for the expenditure involved, as a modern Cleveland Tramrail cleaning house crane installation.

Cleveland Tramrail equipment completely revolutionizes cleaning house procedure and enables one man in the crane cab to run large tonnages through the cleaning cycle usually involving acid dip, water rinse, lime coating and baking. The equipment requires less than one-half the space for the old circular method and by the very nature of the layout used, a cleaner and more orderly room results.

The large number of installations now serving leading rod and wire producers attest to the advantages of the equipment. If you are interested in lower cleaning costs per ton by a method that quickly pays for the original investment, we suggest that you get the facts on Cleveland Tramrail cleaning house cranes.



3,300 lb. loads can be handled with this unit. Note the load bar is equipped with a swivel arrangement permitting turning the hook.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9216 East 288 Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

ELGIN DIAMOND

meets rigid quality standards

at Allegheny Ludlum Steel Corporation, Pittsburgh

When wire is pulled through carbide dies, tremendous heat and pressure are generated. That is why the working surfaces of wire drawing dies must be polished to a near perfect finish. That is why Allegheny Ludlum uses Elgin Diamond.

Elgin Diamond assures the finest possible finish—and in less time—because all Elgin Diamond is precision graded and permanently suspended in a color-identified compound right in the Elgin laboratories. There are no oversize particles to scratch, no "fines" to decrease cutting efficiency.

Hundreds of die finishing applications prove Elgin Diamond reduces costs and produces a better finish every time . . . in less time! Now is the time to try Elgin Diamond and prove it to yourself!

Ask for a free demonstration!

ABRASIVES DIVISION

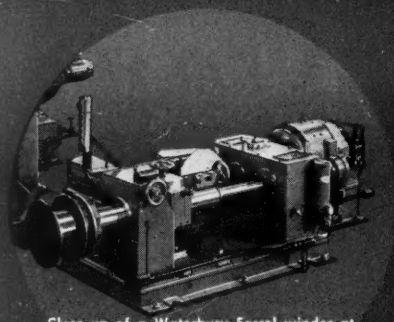
ELGIN NATIONAL WATCH COMPANY

Dept. G

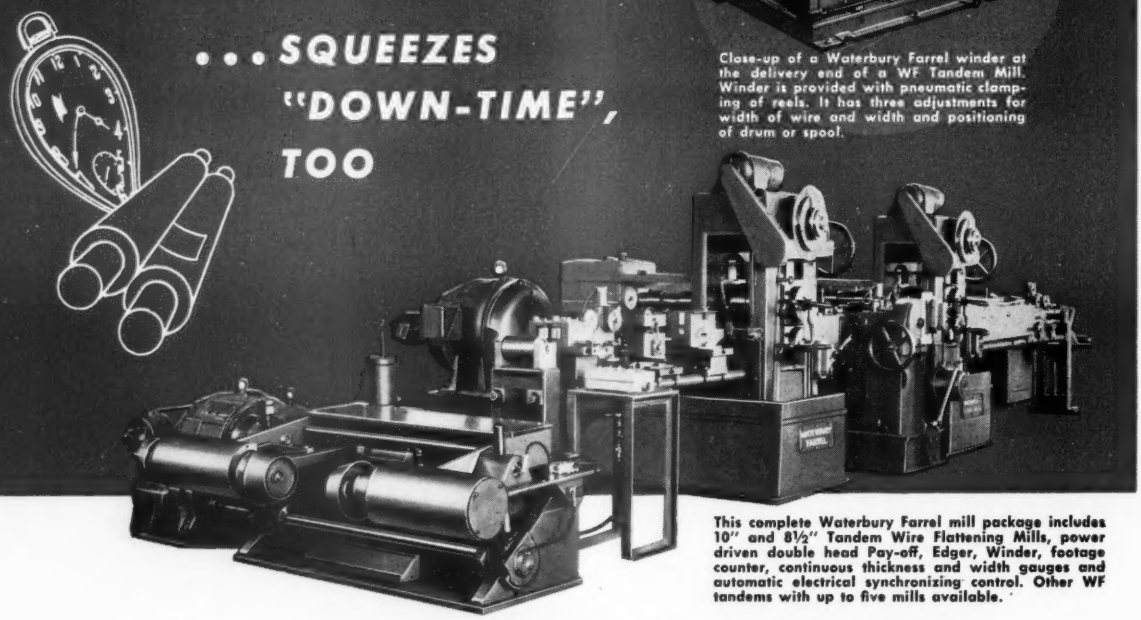
ELGIN, ILLINOIS

THIS WF WIRE FLATTENING TEAM

. . . SQUEEZES "DOWN-TIME", TOO



Close-up of a Waterbury Farrel winder at the delivery end of a WF Tandem Mill. Winder is provided with pneumatic clamping of reels. It has three adjustments for width of wire and width and positioning of drum or spool.



This complete Waterbury Farrel mill package includes 10" and 8½" Tandem Wire Flattening Mills, power driven double head Pay-off, Edger, Winder, footage counter, continuous thickness and width gauges and automatic electrical synchronizing control. Other WF tandems with up to five mills available.

Modern Waterbury Farrel Mill Design Insures High Production Plus Precision . . . Minimizes "Down-Time"

Here are some reasons why Waterbury Farrel Wire Flattening equipment can give you *more continuous,* high speed, precision production.

- Loading payoff and motor driven screwdowns for mills and edgers facilitate threading of wire with minimum effort and time.
- To protect precision operation, soluble oil is circulated internally and externally on the rolls and into coolant enclosures where wire is submerged. A refrigeration system maintains the coolant oil temperature at approximately 70° while a flotation unit keeps it clean and fresh. In addition, high speed mills also have a self-contained, automatically-filtered circulating mineral oil lubrication system for roll necks and drives.
- Transparent lucite covers at vital lubrication points such as gear cases and universal joints make it easy to check lubrication at a glance.
- Anti-friction bearings are used for all rotating members including the winder shaft. High precision anti-friction bearings are used on roll necks and edger arbors. This, combined with precision fitting of component parts enables WF mills to maintain tolerances well inside commercial allowance.
- Tungsten carbide ring rolls permit rolling the toughest alloys and increase roll life.
- Electric control keeps wire tension constant. Dancer rolls are used for fine wire.

Waterbury Farrel designs and builds a wide range of wire flattening mill equipment to suit specific requirements. Various sizes and combinations of single and multiple mill stands with auxiliary equipment are available for flattening ferrous and non-ferrous wire from the smallest diameters to 1" diameter and more. Speeds range up to and above 2500 FPM.

Write for further information.

WATERBURY FARREL FOUNDRY & MACHINE CO.
WATERBURY 20, CONN.
***Sales Offices:* Chicago, Cleveland, Millburn, N. J.**

WATERBURY FARREL FOUNDED 1851

A FEW OF THE MANY TYPES OF METAL WORKING MACHINERY MADE BY WATERBURY FARREL

MILL MACHINERY—Rolling Mills: Strip, Rod, Wire Flattening, (For Ferrous and Non Ferrous Metals) • Also Slitters • Straighteners • Cut-off Saws • Coilers • Winders, etc. *WIRE MILL EQUIPMENT*—Continuous Wire Drawing Machines (Upright Cone and Tandem) • Wire Flattening Mills • Chain Draw Benches • Pointers Swagers • Bull Blocks • String-up Machines • Spoolers, etc. *COLD PROCESS BOLT & NUT MACHINERY*—Headers (all types) • Rivet Machinery • Trimmers • Thread Rolling Machines • Slotters • Nut Formers and Tappers, etc. *POWER PRESSES*—Crank, Cam and Toggle; also Rack and Pinion Presses • Eyelet Machines Multiple Plunger Presses • Horizontal and Hydraulic Presses, etc.

WF 9

WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 28 DECEMBER, 1953 No. 12

Designated as Official Publication By The Wire Association

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WIRE and WIRE PRODUCTS is indexed regularly by Engineering Index, Inc., New York, N. Y.

RICHARD E. BROWN, President and Publisher

R. S. Spengel, Secy.-Treas. & Gen'l. Manager
J. Edward Donnellan, Vice-President

Edmund D. Sickels, Editor

— ASSOCIATE EDITORS —
Lancaster, Allwine & Rommel, Consultants on Patent Information

Publication Office: Jersey City, N. J.
Executive Office: 453 Main St., Stamford, Conn.
*Reg. U. S. Pat. Off.

WIRE & WIRE PRODUCTS, Vol. 28, No. 12, December, 1953. Publication Office at One Sherman Avenue, Jersey City, N. J. Executive Office 453 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec'y. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy, except October Convention Issue and January Convention Proceedings Issue, $1.00 per copy; Foreign $7.50 per year. Entered as second class matter, at the Post Office, Jersey City, N. J., under the act of March 3, 1879.

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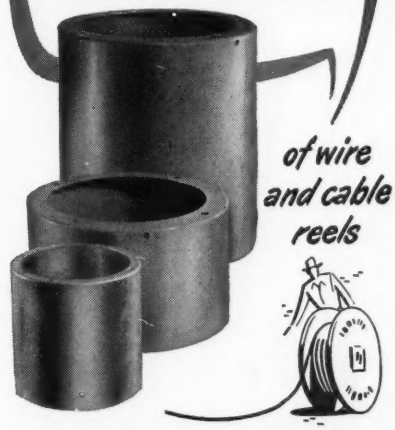
SIMPLE 4-STEP ASSEMBLY



of wire and cable reels

NILES

FLANGED STEEL TRAVERSES

... eliminate the labor of handling large numbers of small parts ... make it easy to assemble reels in four simple steps.

And, they make up into strong reels that can be used over and over. Actual experience records show as much as sixteen years' service without refinishing or major maintenance, as well as a 50% to 100% increase in the number of trips before cut downs or scrapping of wooden heads.

Niles Flanged Steel Traverses are manufactured in sizes up to 56" diameter and 48" traverse—in plain, painted or hot dip galvanized finish—as light as 18 gauge steel. Width of flange and number of bolt and drain holes are furnished to your specifications. Available for prompt delivery. *Write for prices.*

• • •

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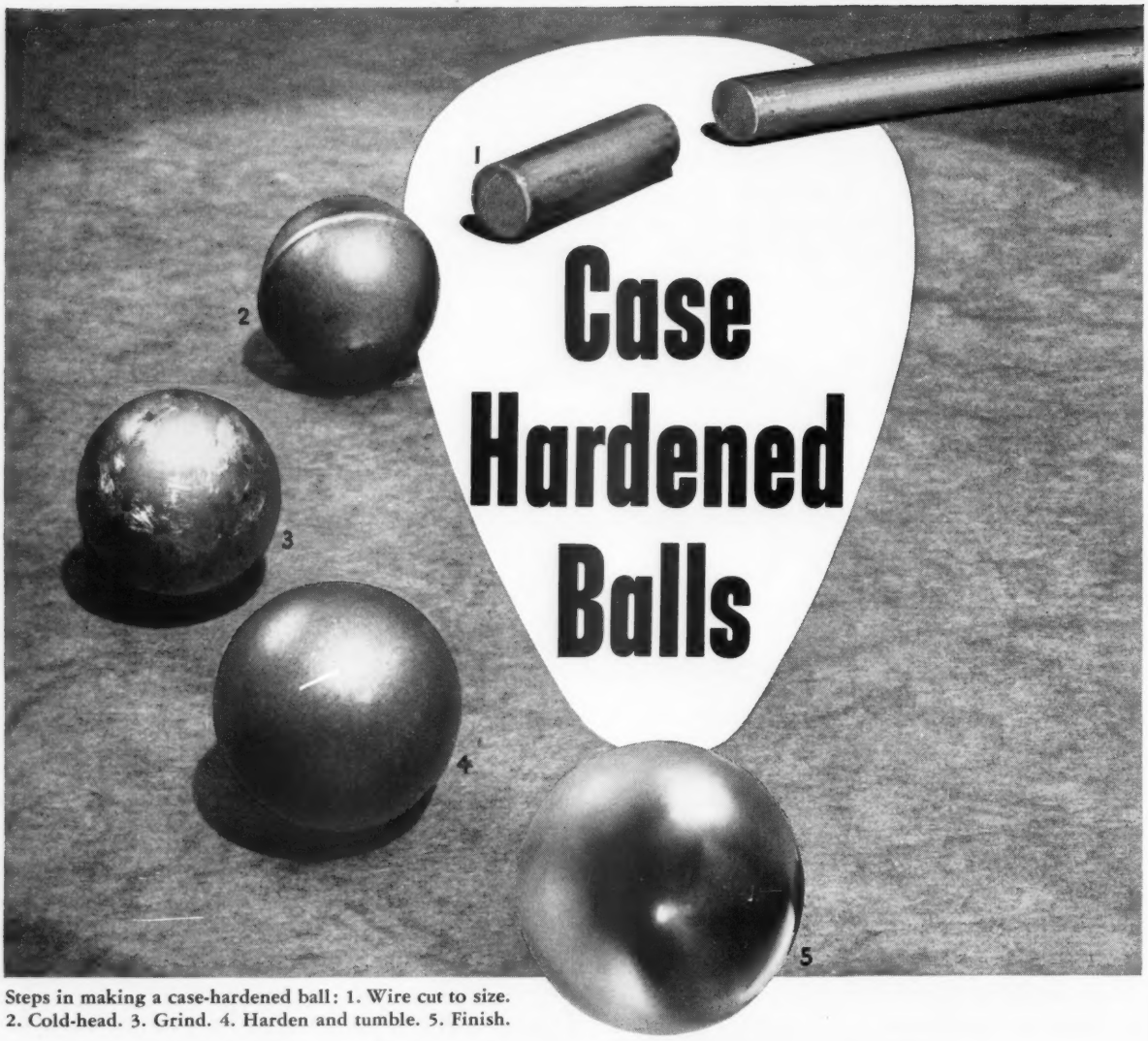
REPUBLIC STEEL

PRESSED STEEL DIVISION
REPUBLIC STEEL CORPORATION
NILES, OHIO



Steps in making a case-hardened ball: 1. Wire cut to size. 2. Cold-head. 3. Grind. 4. Harden and tumble. 5. Finish.

a rugged test for cold-heading wire

In making case-hardened balls the steel wire is subject to some pretty severe fabricating operations: cold-heading, dry grinding, hardening, tumbling, and finishing. But if it's Bethlehem wire, it passes this test with flying colors.

Making wire for a great variety of cold-headed items is a Bethlehem specialty. In our modern wire mills the wire gets extra-special attention—from the time we melt the steel right down to the final drawing of the wire. You can count on our wire to be uniform in quality, temper and finish. These are details that we watch carefully to help you make your product better and at lowest cost.

Bethlehem makes a type of steel wire for just about every kind of application. If you manufacture a product from wire, give us a call. Phone our nearest sales office or write to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Bethlehem **COLD-HEADING WIRE**

BETHLEHEM STEEL

WIRE INSULATING EXTRUDERS

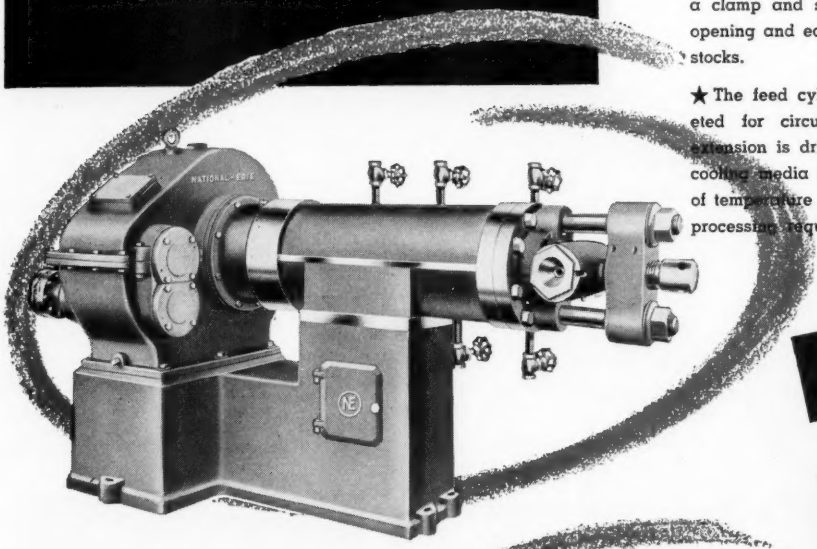
The National Erie extruder has been developed, after years of experience in design and use, into a machine with outstanding production features:

★ Drive gearing with precision cut gears and heavy duty thrust bearings of ample capacity have proved the superiority of National Erie design through years of trouble-free operation.

★ Anti-corrosive abrasion resistant cylinder liners and Stellite tipped screws insure long life.

★ The plastics insulating extruder is equipped with a clamp and swing type head which permits quick opening and easy access for cleaning when changing stocks.

★ The feed cylinder on the plastics machine is jacketed for circulation of water and each cylinder extension is drilled for circulation of the heating and cooling media for zone temperature control. A choice of temperature control systems is available to suit the processing requirements of any material.



FOR PLASTICS

FOR RUBBER

A typical 4½" plastics insulating machine is illustrated above. A typical 3½" rubber insulating machine is illustrated at the right. Both of these machines are available in sizes 1½", 2½", 3½", 4½" and 6". Other sizes available as special designs.

NATIONAL ERIE STAFF JOINS HALE AND KULLGREN, INC.

The engineering organization of National Erie, including personnel, drawings and records, have transferred to the offices of Hale and Kullgren, Inc., at 613 East Tallmadge Avenue, Akron, Ohio, and are available to you for prompt service on your processing problems. Complete service on parts and information for all existing National Erie equipment is available.

Complete service on National Erie equipment

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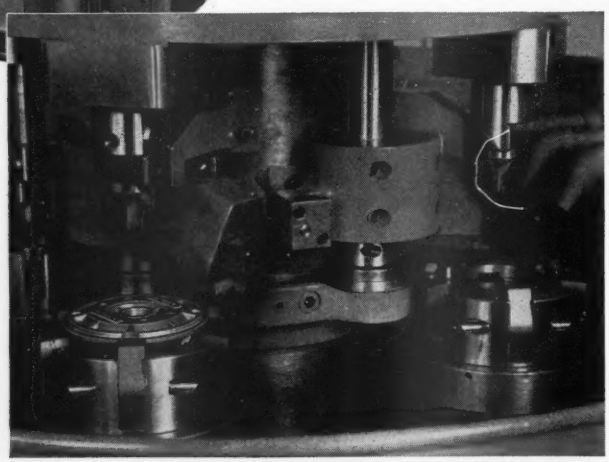
PITTSBURGH, PA.

Plants in Warren, Ohio
Ellwood City, Penna.

ASK BAIRD ABOUT IT!

HIGH PRODUCTION TOOLING

(Above) Front view, showing splash guards for wet cutting.



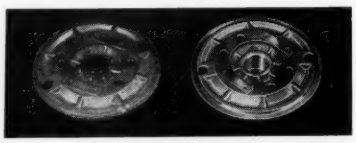
(Right) Tooling set-up for finishing a generator end plate.

TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

. . . and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

This typical Baird tooling set-up bores the hole, faces and chamfers the hub, and turns the flange of a generator end plate. Cycle time 19.48 seconds, 5 seconds per piece, 720 per hour. Feed: boring hole and facing hub .0039" . . . turning flange .005" and .002" (forming tools). Cutting speeds: boring 348 ft.; turning 1985 ft. per minute.

Safety for operator and prevention of machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless spindles are revolving; electrical equipment is enclosed, wiring concealed.



BEFORE AND AFTER

FEATURES BAIRD 4-SPINDLE VERTICAL LATHE

1. Compact design.
2. Easy to tool and operate.
3. Simple . . . dependable.
4. Extremely accurate.
5. Unusually versatile.
6. Outstanding production records.

Installation of Baird automatic machines is a step in the right direction against tough competition. "Ask Baird about it!"

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

7 BA 53

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

Morgardshammar's NEW Wire Drawing Machine Type Beeline

A High Production Wire Drawing Machine of straight-line type, for all qualities of wire. The following sizes are manufactured at present:

This picture shows a Beeline DG IV, built for an inlet wire diameter of about 7 mm (abt. 2 SWG) (high carbon steel).

BEELINE DM 3

intended for wire diam.	3 mm (abt. 11 SWG)
Maximum drawing speed	16 m/sec. (abt. 3,200 ft./min.)
Maximum diam. of the finishing block	400 mm (abt. 15¾")
Optional number of blocks.	

BEELINE DG 4

intended for wire rods	diam. 5 to 7 mm (abt. 6 SWG to 2 SWG)
Maximum drawing speed	10 m/sec. (abt. 2,000 ft./min.)
Maximum diam. of the finishing block	600 mm (abt. 23½")
Optional number of blocks. Continuous speed adjustment from about zero.	
Power required	200 h.p.
Diam. of the take-up block	520 mm (abt. 20½")
Coil weight about	250 kg (abt. 550 lbs.)
Space required about	16 m² (abt. 172 sq.ft.)
Total weight about	12 metric tons

We have long experience in manufacturing wire drawing machines. Let us help you with your problems. We shall be glad to answer your questions promptly.

MORGÅRDSHAMMAR

CABLES: MORGARDSHAMMAR, LUDVIKA • PHONE: 0240-71100

SWEDEN

the problem: ***how to produce* BUNCHED WIRE *with the smooth concentric qualities of stranded wire in a limited floor area?***

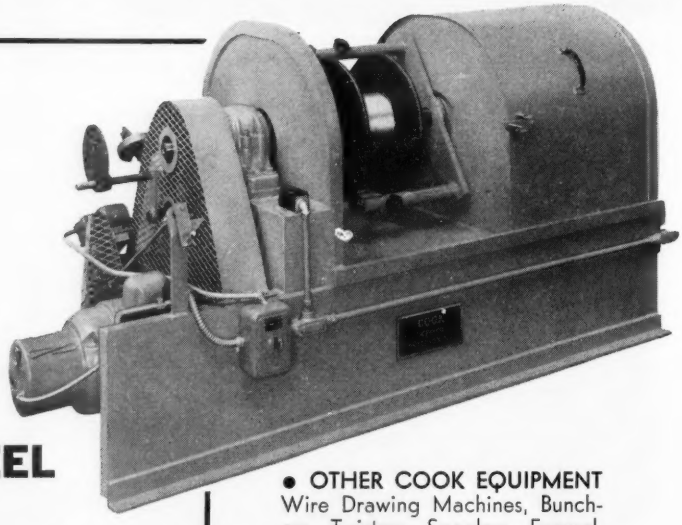
the solution: ***install a* COOK BUNCHER *with these features:***

HIGH SPEED

SINGLE TWIST FLYER

AUTOMATIC LAY CONTROL

LARGE TAKE-UP REEL



- *See Specification Chart below for the COOK BUNCHER most suited to your requirements.*

- **OTHER COOK EQUIPMENT** Wire Drawing Machines, Bunchers, Twisters, Spoolers, Enameling Machines, Tinning Pots, Wrapping Machines, Cabling Machines, Enameling Take-Ups and Pay-Offs, Tinning Take-Ups and Pay-Offs, Wire String-Up Machines and Special Machinery

COOK MANUFACTURING COMPANY has a complete line of BUNCHING EQUIPMENT to accommodate the following reel sizes.

Model	Size	Capacity
B-H-8	8" x 6"	40 lbs.
B-H-12	12" x 8½"	100 lbs.
B-H-16	16" x 8½"	200 lbs.
B-H-21	21" x 8½"	350 lbs.
B-H-22	22" x 11"	500 lbs.
B-H-24	24" x 11"	700 lbs.

ALL COOK BUNCHERS have successfully formed bunched strands of 7, 10, 16, 19, 26, 41 and 65 wires with such concentricity as to enable its passage through an extruding die of only 1 mil clearance. In addition, such constructions as 27/36 and 41/36 have been bunched at high speed with perfect concentricity on these versatile machines.

•

Write today for descriptive literature giving details of construction and performance.

COOK MANUFACTURING COMPANY

50 East 25th Street, Paterson, N. J. Telephone: ARmory 4-6380 or 6381

LOOKING FOR QUALITY?

"DIAMACONTROL"

IS YOUR ANSWER TO IN-PROCESS CONTROL OF WIRE AND CABLE DIAMETER

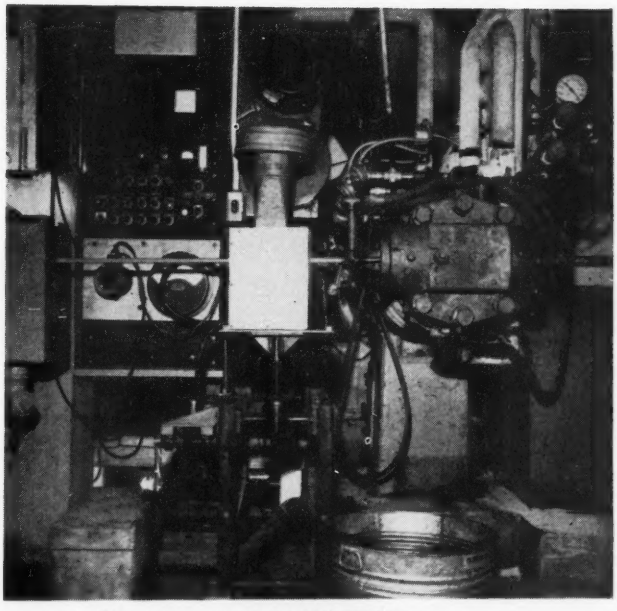
S CRAP REDUCTION

E QUIPMENT EFFICIENCY

R EDUCED COSTS

C ONTROLLED QUALITY

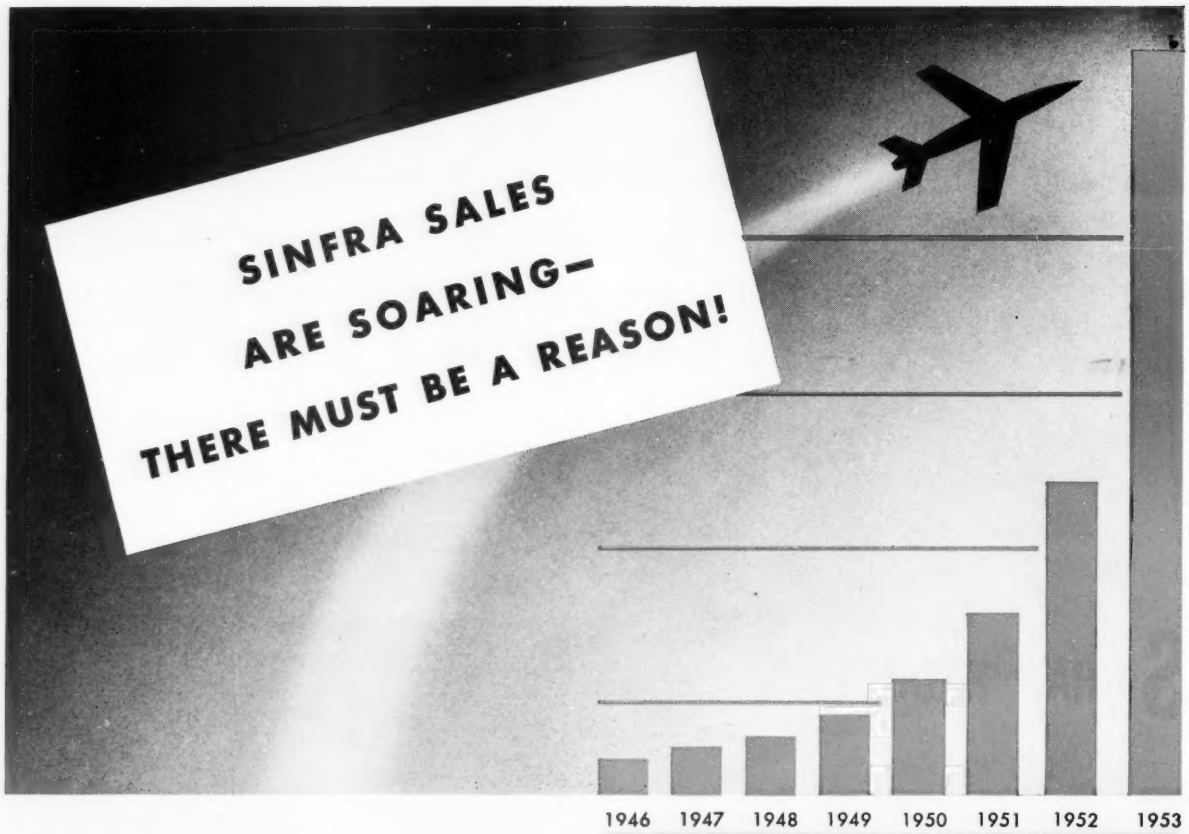
NO —CONTACT
—DRIFT



Showing "DIAMACONTROL" set up for operation in plant of large manufacturer of electric wire and cable.

ACT NOW—SEND FOR FREE LITERATURE TO

STANDARD ELECTRONIC RESEARCH CORP.
2 EAST END AVENUE NEW YORK 21, N.Y.
Telephone: RHinelander 4-4100

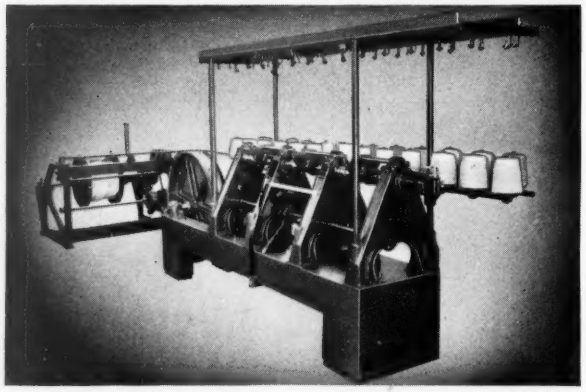


More and more, leading wire manufacturers the world over are proving the advantages of the *Fidelity Sinfra Knitter.**

With each new installation the *Sinfra* establishes —time after time—its ability to cover wire faster and more economically than any other method.

Today, the list of *Sinfra* users includes the world's foremost manufacturers of Wire and Cable.

Why not prove for yourself the outstanding advantages of this amazing machine? Write today for Catalog W or visit the new show rooms at our plant.



*Approved by Underwriters' Laboratories, Inc., American Standards Association, Association of American Railroads, Canadian Standards Association, and Federal Specification J-C-145.

Designers and Builders of Intricate, Automatic Precision Machines

SINCE 1911

FIDELITY MACHINE COMPANY, INC.

3908 - 18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.

Export Dept.:
25 Beaver Street, New York 4, N. Y.

Canadian Representative:
The Larson Co., Toronto, Ontario, Canada.

Can our metallurgists save YOU money?

IF you're having steel wire trouble, we'd like to have the chance to help you. Our metallurgists are real experts at solving problems involving the use of manufacturers wire. Sometimes they can suggest the use of a different wire that saves time, or money—or both—for the manufacturer. Sometimes they can come up with a change in fabricating technique that results in a real cost reduction. And, if you're in difficulty because you need a special kind of manufacturers wire, our staff will work with you to develop a new wire that will meet your exact specifications.

We've had more than a century of wire-making experience. Today, as the "Wire Headquarters of the World" we supply our customers with more than 400 different types of U·S·S American Manufacturers Wire . . . and all of it is of uniformly high quality.

Consultation is without charge or obligation—just call our nearest sales office.

If you make it of wire... make it of the best!

U·S·S AMERICAN MANUFACTURERS WIRE

AMERICAN MANUFACTURERS WIRE

AMERFINE—*High-quality fine wire.*

AMERSPRING—*music steel spring wire.*

AMERLOY—*alloy heading wire.*

AMERTEMP—*heavy-duty oil-tempered wire.*

AMERHEAD—*uniform heading wire.*

AMERSTITCH—*extra-tough metal stitching wire.*

USS TRADE MARK

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS

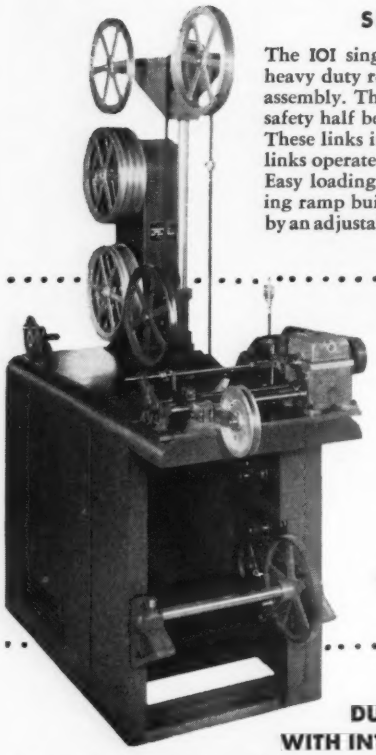
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

STANDARD LET-OFF and TAKE-UP STANDS for the WIRE INDUSTRY

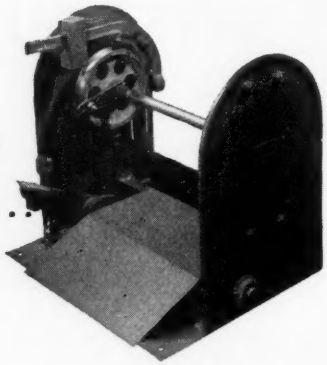
IOI ENGINEERING VERSATILITY

Speed, control and change of pace are basic factors in **IOI** design of continuous materials processing equipment. Widely experienced in the application of these factors to continuous systems, **IOI's** engineers have embodied technical skill, sound engineering principles and ingenuity in all **IOI** equipment, to develop standard units that are flexible enough to meet a variety of applications with simple variations.



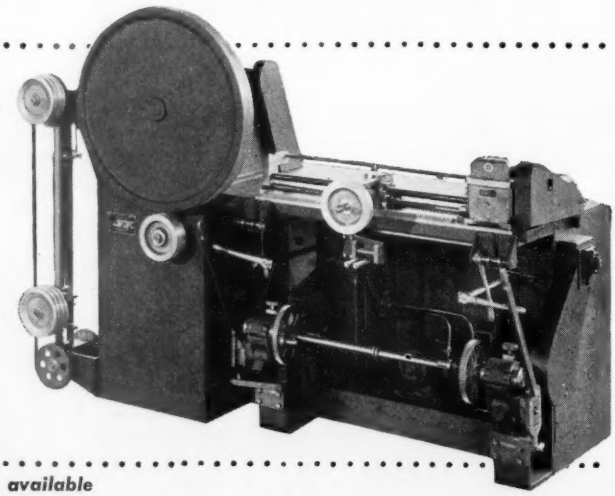
SINGLE REEL LET-OFF STAND

The IOI single supply reel Let-Off stand consists of a rigid heavy duty reel mounting equipped with reel shaft and brake assembly. This shaft assembly, holding the reel, is carried on safety half bearings mounted on heavy vertically guided links. These links in turn are raised and lowered by power amplifier links operated by a latching foot pedal outside the stand frame. Easy loading and unloading are assured by a steel plate loading ramp built into the stand. Brake shoe tension is controlled by an adjustable counterweighted arm and brake shoe assembly.



SINGLE REEL TAKE-UP STAND WITH CAPSTAN

Integrating reels, capstans, power source with hydraulic or electronic controls into one unit, IOI's variable-speed, constant-tension Take-Up machine is unexcelled for smooth, stepless winding of continuous and semi-continuous materials after processing operations. It has everything: winding speeds of wire and other materials are 3 to 5 times faster than previously; control in handling materials requiring tight wrap or loose wrap with equal facility; change of pace which continuously regulates the speed of Take-Up reels by automatic synchronization to maintain tension regardless of diameter change.



DUAL REEL TAKE-UP WITH INTEGRAL CAPSTAN

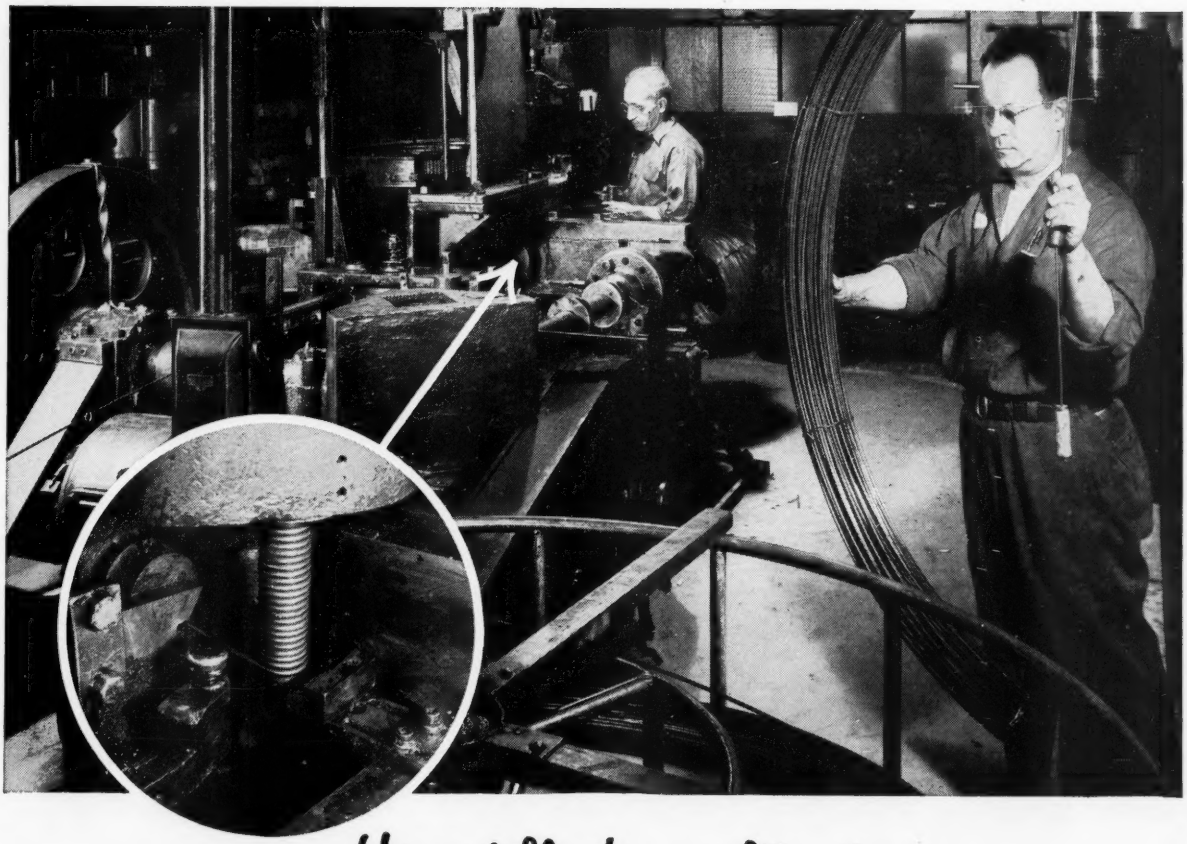
This combination capstan and continuous Take-Up system was especially designed for continuous extrusion take-up of synthetic or rubber coated wires, cords or cables. By manual means the wire or strand is shifted from the full reel to the empty one without interrupting the winding process. All functions of the operation are combined in one compact machine. An ingenious IOI reel mounting features a demountable shaft and bearing housing assembly carried by a heavy bearing mounting on a lever-operated tilting base. Lever operation of the housing raises reel into operating position easily. Reel flanges are set on the floor. Flange edges of the reel are subject to little or no distortion or bending, prolonging the reel life and facilitating level winding.

These standard units (with or without drives) are available now, ready for prompt shipment. For complete information write:

IOI ENGINEERING VERSATILITY

INDUSTRIAL OVENS, INC.

13825 TRISKETT ROAD CLEVELAND 11, OHIO



Users tell the quality story

To Produce Hundreds of Thousands of High-Quality Specialty Springs, the U. S. Steel Wire Spring Company Insists on *Uniformity* in Oil Tempered Spring Wire

Turning out fine quality custom-made springs of unique design for auto and farm machinery manufacturers has been the specialty of this well-known Cleveland, Ohio, spring maker for over 35 years . . . he knows the secrets of quality production. One of these secrets is uniformity of wire within grade specifications.

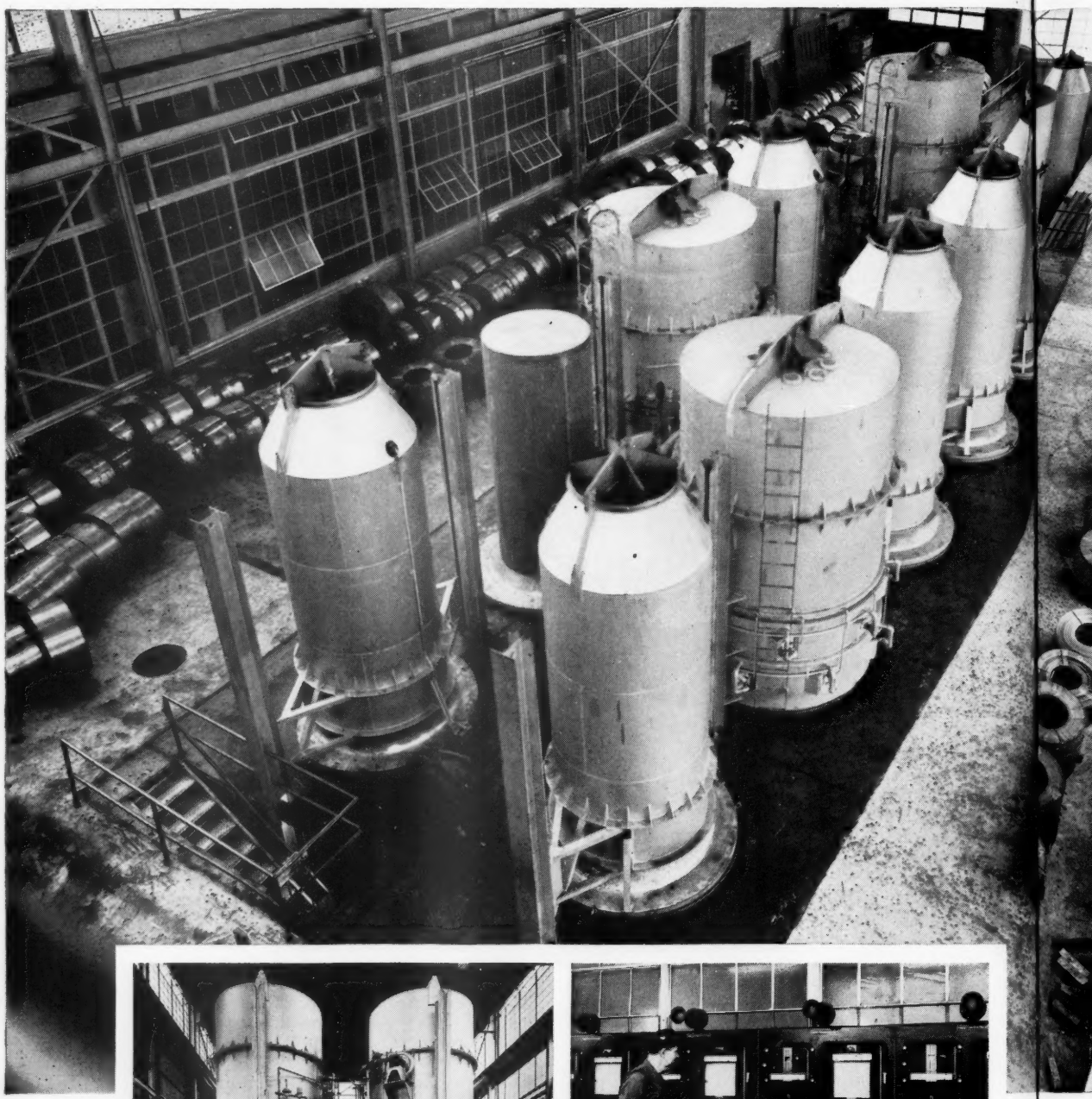
For example, the Sleeper-Hartley automatic torsion machine above makes a .243″ oil tempered spring wire into some 4,400 hood hinge springs for automobiles in a day. The wire must work smoothly in production, give sturdily built springs that prove out individually under tough usage.

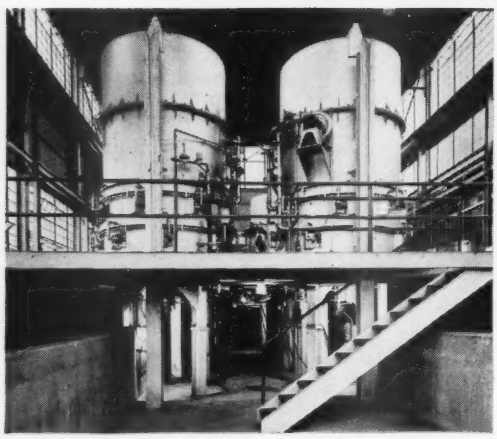
To meet the stiff requirements for this job, and for hundreds of other applications, U. S. Steel Wire Spring Company uses hundreds of tons of Pittsburgh Steel's Oil Tempered Spring Wire a year in a broad range of sizes. They know they can depend on it to make long runs, avoid production delays, reduce rejections, and give good service.

If you are not using Pittsburgh Steel Oil Tempered Spring Wire in the manufacture of your springs and wire specialties, why not get complete information now? Write Department WW, Pittsburgh Steel Company, Grant Building, Pittsburgh 30, Pa.

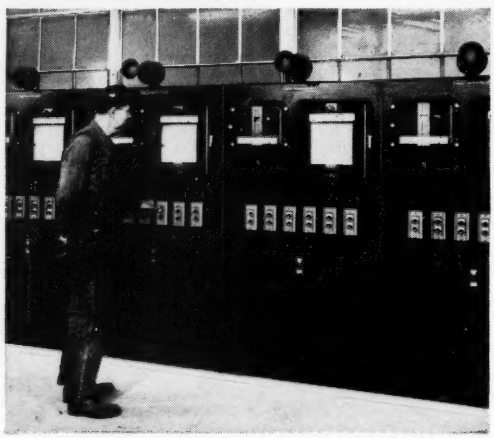
Pittsburgh Wire

a product of **Pittsburgh Steel Company**





This view shows the sub-mounting arrangement of the Westinghouse Cylindrical Bell-Type Furnace bases. This makes motors and controls easily accessible.



These are the pyrometers and mounting panels at the Thompson Wire Co. that control and indicate the temperatures of the furnaces. Note alarm horns.

"Westinghouse Furnaces stepped up our production"

. . . says Thompson Wire Co.

Thompson Wire Co. is now using four *Gas-Fired* Westinghouse Cylindrical Bell-Type Furnaces, 12 bases, 12 inner hoods, and 8 air-cooling hoods. A fan, mounted on top of each cooling hood, draws air between the work hood and cooling hood, exhausting heated air to the top, thus accelerating cooling of the charge.

This entire new operation has given Thompson Wire Co., greater load per heat, faster cooling, less maintenance costs and increased production.

Investigate Westinghouse Heat-Treating Furnaces with an eye toward cutting costs and increasing capacity.

For more information regarding Westinghouse Heat-Treating Furnaces, write or call your nearby Westinghouse office. Westinghouse Electric Corporation, Industrial Heating Department, Meadville, Pa.

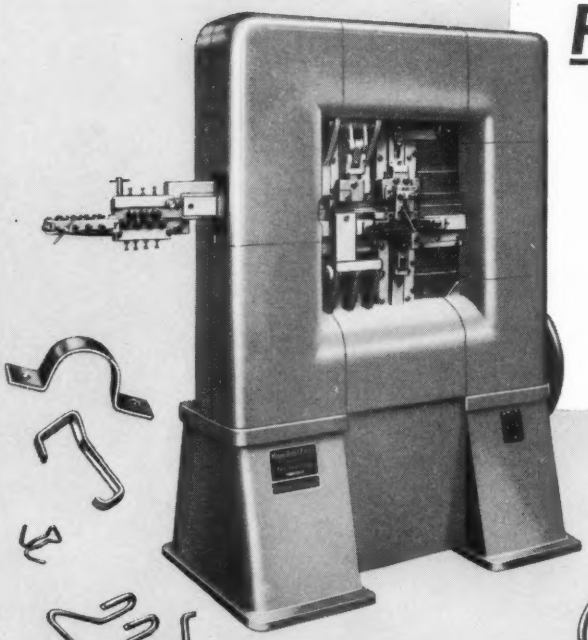
J-10386

YOU CAN BE SURE... IF IT'S

Westinghouse

IF YOUR PRODUCT CALLS FOR HEAT-TREATING...IT CALLS FOR A WESTINGHOUSE FURNACE ...GAS OR ELECTRIC

HOW VERSATILE CAN YOU GET?



P-L-E-N-T-Y... with

MEYER, ROTH & PASTOR'S

WIRE AND STRIP FORMING MACHINE

UNIVERSAL...

AUTOMATIC...

5 SLIDES, OR MORE...

MEYER, ROTH & PASTOR'S machines mass-produce these and many other parts.

- 5 different size machines for fully automatic, economical production of parts from wire coil or strip stock.
- Various sizes produce from 60 to 300 pieces per minute in wire up to .145" diameter or strips up to 25/32" wide.
- Simplified tooling—machine can be quickly re-set to produce different parts.
- Vertical design takes up little floor space.
- Positive and direct control of the bending slides insures high output and trouble-free operation.
- Roller straightening attachment (7 vertical and 7 horizontal rollers) can be opened—you can feed material without disturbing the roller setting.
- Special gripping device insures uniform feed and does not mark wires or strips.
- 3-speed drive.
- Standard equipment includes 4 forming and 1 punching slide and a complete set of tooling. Additional forming slides and attachments, including a blanking and punching attachment, can be supplied.

WRITE FOR BULLETIN

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

Boost... your Output!

from...ROD BREAKDOWN
to...FINE WIRE
with "SYNCRO"
Wire Drawing Machinery

MODEL B-16 FINE WIRE MACHINES

May WE make suqqestions that might help YOUR PRODUCTION effort?

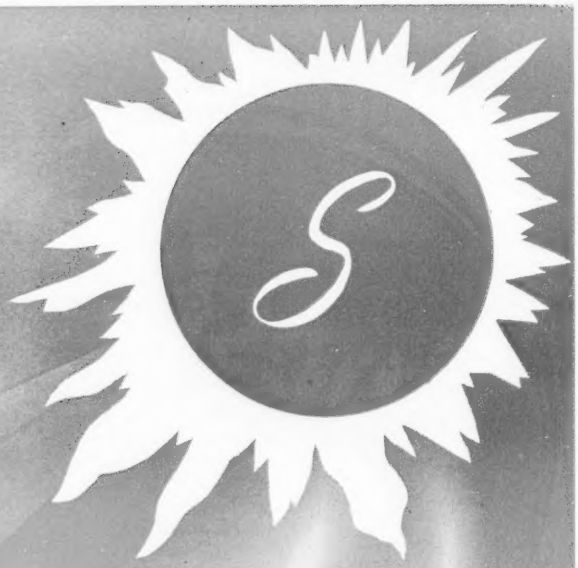
SYNCRO®
MACHINE COMPANY
PERTH AMBOY • NEW JERSEY • U.S.A.
Affiliated Co: WINGET - SYNCRO, Ltd • Rochester • Kent • England

Better Machinery for the Wire Industry

WIRE DRAWING MACHINES - STRANDERS - DIE STRINGERS - CONTINUOUS ELECTRIC ANNEALERS - CAPSTANS - WIRE INSULATORS - HEAVY DUTY TAKE-UPS - TAPERS - SPECIAL MACHINERY

STAYS BRIGHT AS DAY ! WITH

STANDARD'S BRIGHT WIRE COMPOUNDS



STANDARD INDUSTRIAL COMPOUNDS COMPANY has pioneered most of the outstanding contributions to better wire drawing through better lubricants. Consult with **STANDARD** for the solution of your difficult problems. We welcome your inquiries.

STANDARD WIRE DRAW NO. 15

A new and different Compound for wet drawing, made from new and different materials that have a natural affinity for metals, a natural wetting-out characteristic, without the addition of a wetting agent.

Protects the wire from oxidizing for considerably longer periods than conventional compounds. Preserves the bright finish on copper coated or liquor finished wire and prevents tarnish on copper or brass wire for longer periods of time.

Below are some of the advantages of this compound:

A. Small amounts needed. Due to the natural affinity for metal small amounts of this compound are needed. Draws high carbon wire at high speeds with a fat content as low as .30 per cent, because of this affinity for metal and the natural wetting-out characteristics.

B. Low pH value.

C. Protects steel wire from rusting and copper coated and liquor finished steel wire from oxidizing. Protects copper and brass wire from tarnishing.

D. A clean compound. Keeps equipment clean and drawn wire has a clean finish.

Contact one of our representatives below or our home office for details on this new compound and a sufficient quantity for test will gladly be furnished.

Bruce W. Siemon
2400 Morrow Pl.
Pittsburgh 34, Pa.

John A. Moritz, Jr.
4600 W. Ferdinand St.
Chicago 44, Ill.

Earl A. Bowers
5536 Lisette
St. Louis, Mo.

Charles P. Orr
Caledonia Park
Fayetteville, Pa.

Standard Industrial
Compounds Co.
Millbury, Mass.
Arthur J. O'Mara

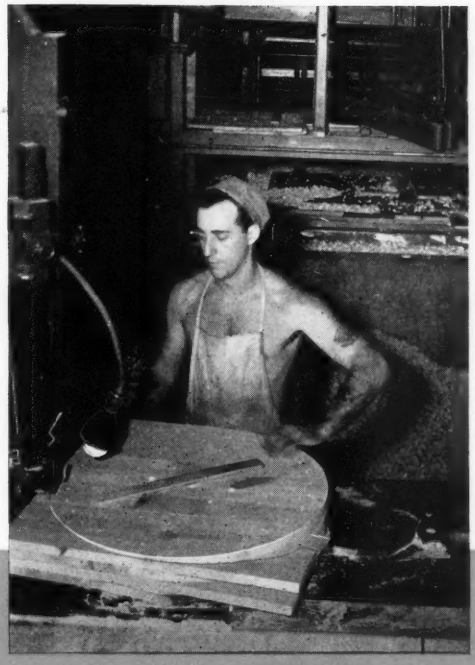
wire drawing lubricants **Standard INDUSTRIAL COMPOUNDS CO., INC.**

4600 WEST FERDINAND STREET
CHICAGO 44, ILLINOIS

ARE YOUR WOOD REELS PRECISION MADE?

Reels made by Bridge are. They're manufactured in a modern plant that is wholly devoted to making only one product—WOOD REELS.

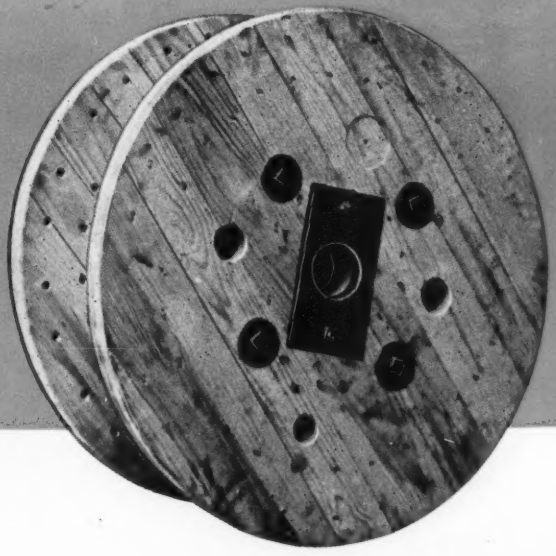
Straight-line production methods and automatic tools and jigs assure you of well and accurately made reels that conform exactly to your specifications. That's why they are of uniform high quality, as well as being low in cost. Try BRIDGE REELS!



Right: Cutting out reel head.

YOUR SPECIFICATIONS FOLLOWED

Every wire mill has its own reel specifications. Bridge's production system is designed to meet them rigidly and to furnish you with strong reels that will withstand severe handling. If you specify a delivery date—that will also be met on schedule. BRIDGE gives you what you order.



PLUS A SPEEDY SHIPPING SERVICE

Bridge delivers by truck to your door within a radius of 200 miles from the plant. Fast freight will bring you Bridge reels in 5 days or less east of the Mississippi.

BRIDGE
MANUFACTURING CO.
HAZARDVILLE, CONN.

Phone
Thompsonville, Conn.:
Riverview 9-8308

WOOD REELS FOR SHIPPING AND SHOP

12" to 96" in diameter; knocked down or assembled; returnable or non-returnable; wood heads for steel drums.

Let us quote on your reel needs. Send your specifications. Better yet, visit our plant and see how and why our reels are made so well at so low a cost.

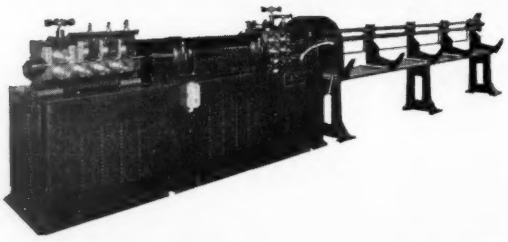
THE BIG NEWS IN WIRE STRAIGHTENING IS THE NEW

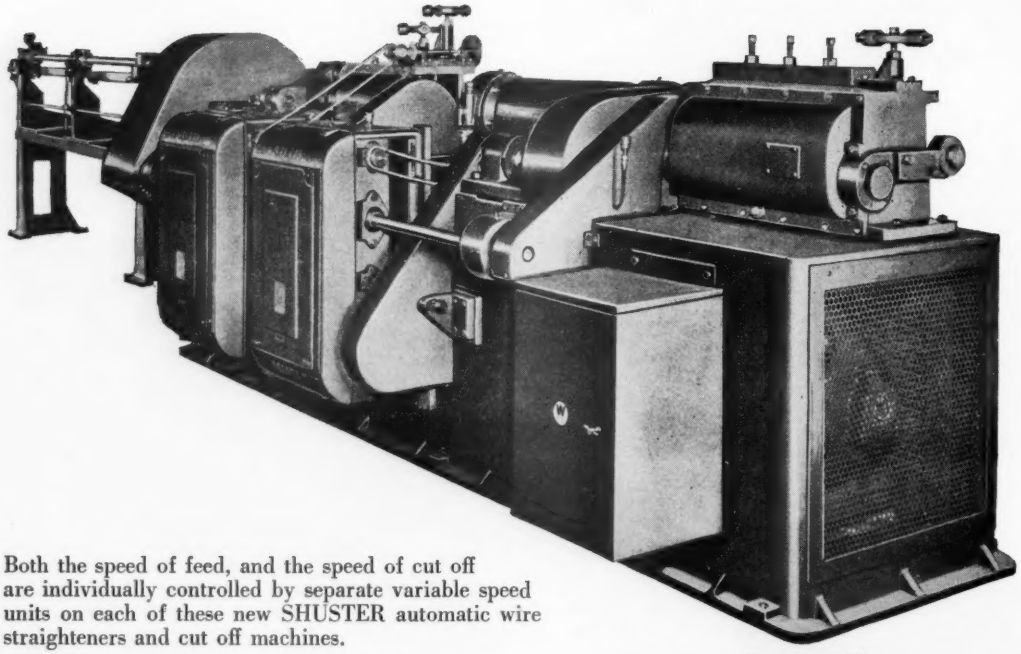
SHUSTER *Since 1866*

Dual Control

3 AV & 4 AV

with **INFINITE SPEEDS**





Both the speed of feed, and the speed of cut off are individually controlled by separate variable speed units on each of these new SHUSTER automatic wire straighteners and cut off machines.

No. 3AV handles wire 1/2″ dia. max.; 4AV will take 11/16″ max.

Of all SHUSTER machines built since 1866, we feel these are the best yet. Write for Bulletin 37V and get the complete story.

Manufactured by

METTLER MACHINE TOOL, INC.

132 W. Lawrence St., New Haven, Conn.

Representatives in all principal cities and in foreign countries.

NEW YORK OFFICE: Eleven Broadway WHitehall 4-5480

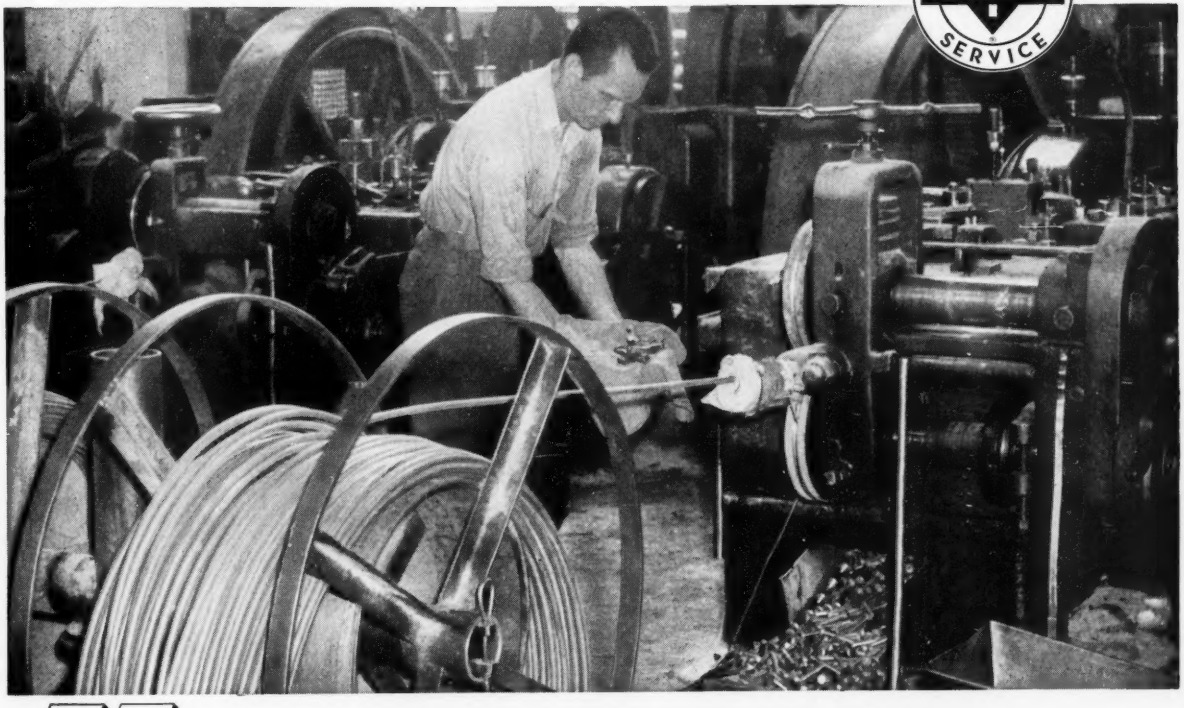
SHUSTER *Automatic* *Since 1866* WIRE STRAIGHTENING AND CUTTING MACHINES

If you make bolts . . . how many wind up in your scrap can . . . like this?

THE birth of a bolt is tough on steel. Cold headers chop it, pound it. Trimming and threading machines hand it another beating. If the steel is imperfect, bolts split. **Profits go into the scrap can!**

That's why shops like this one make their bolts from Youngstown Cold Heading Quality Bolt Wire or from wire drawn from Youngstown Cold Heading Quality Rods. Youngstown controls each step in steel making from the ore to the finished product. This control gives you top quality steel—free from injurious defects. Payoff comes when thousands of bolts come pouring from your machines—each one perfect and a profit maker! Call or write your nearest Youngstown office for quick service and information.

QUALITY YOUNGSTOWN SERVICE



Youngstown COLD HEADING QUALITY WIRE AND RODS

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

to the friends we've made
and the ones we hope to make—
a very

MERRY CHRISTMAS

—and a prosperous New Year!

Steelskin LUBRICANTS

R. H. MILLER
Company, Inc., Homer 1, N. Y.

finer dies faster for the wire industry with...

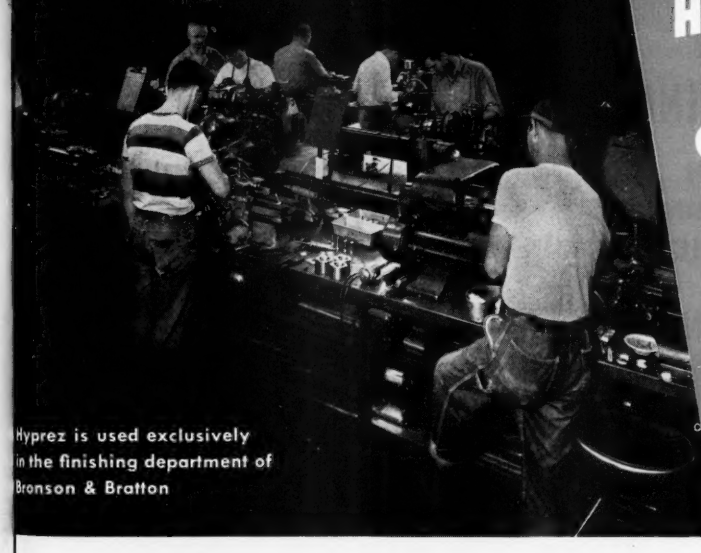
Hyprez used f
flawless die finish
modern Chicago pla
of Bronson & Bratto
a leading suppli
of tungsten-carbi
products for t
wire indust

HYPREZ

High Precision DIAMOND COMPOUNDS

For economy of muscle, time and cost, Bronson & Bratton, Inc., Chicago, and scores of other die manufacturers and users, demand Hyprez, the original Diamond Compound.

Hyprez is engineered to highest standards of performance: diamond particles of exact grading and concentration; a vehicle assuring permanent suspension; integral color identification; maximum finishing action . . . A complete range of grades, from coarsest to finest.



Hyprez is used exclusively in the finishing department of Bronson & Bratton

Ask for a free demonstration or technical bulletin No. W-1253

HYPREZ DIVISION

ENGIS EQUIPMENT COMPANY, CHICAGO 5, ILL.

431 SOUTH DEARBORN ST.

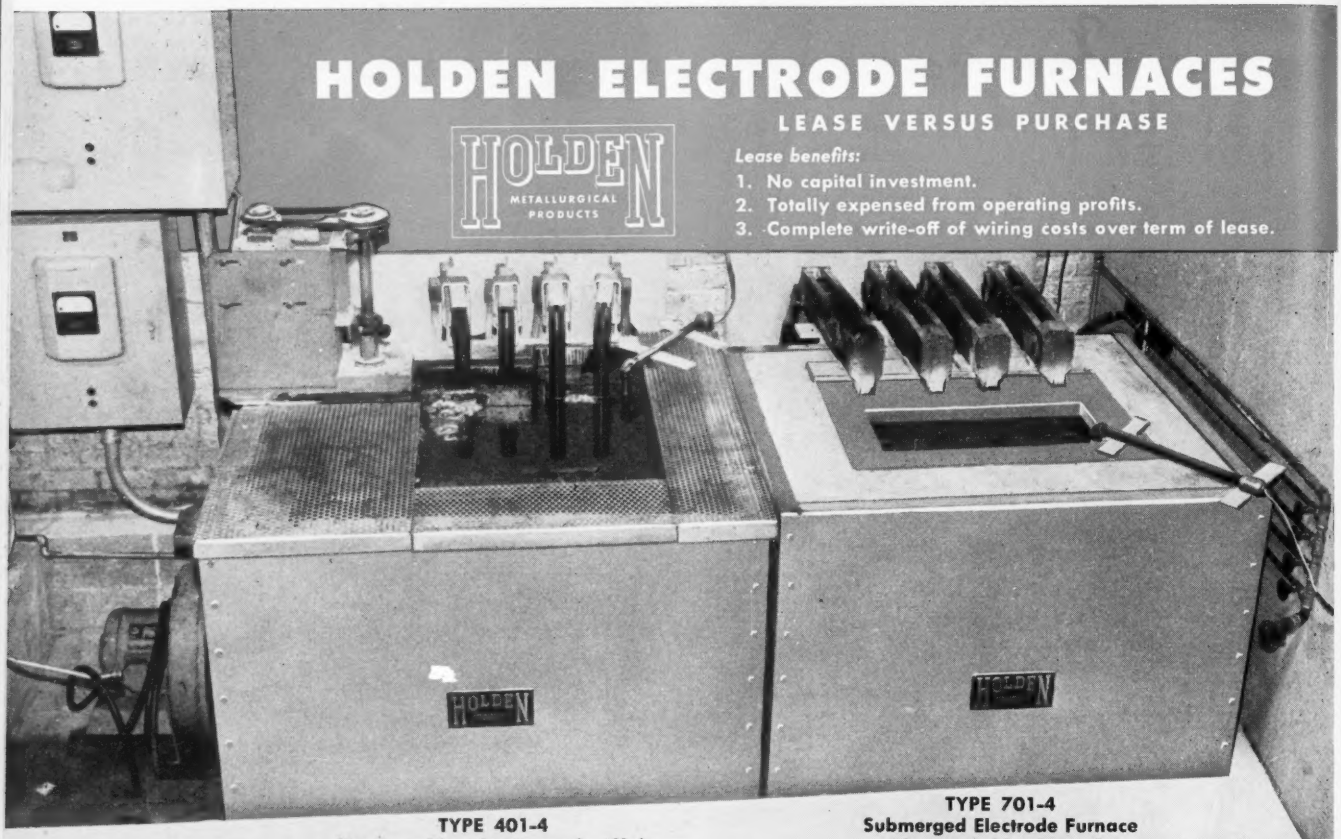
HOLDEN ELECTRODE FURNACES

LEASE VERSUS PURCHASE

HOLDEN METALLURGICAL PRODUCTS

Lease benefits:

1. No capital investment.
2. Totally expensed from operating profits.
3. Complete write-off of wiring costs over term of lease.



TYPE 401-4
Marquenching-Austempering Unit

TYPE 701-4
Submerged Electrode Furnace with removable electrodes.

BENEFITS OF MARQUENCHING AND AUSTEMPERING:

1. LESS DISTORTION
2. IMPROVED WEARING PROPERTIES
3. IMPROVED PHYSICAL PROPERTIES

WRITE FOR 7-PAGE AUSTEMPERING—MARTEMPERING BULLETIN

NEWS! NEWS! NEWS!

HOLDEN MARQUENCHING #296

USEABLE RANGE 350-700° F.

1. This new salt contains a coagulating material which separates out chlorides.
2. Your melting point and quenching rate can be maintained under any production operating conditions.
3. Any sludges are easily removed as soft residual material.
4. This product can be used in Holden Marquenching units and competitive furnaces.

IMPORTANT! We can supply our Marquench Additive #356 which can be added to your present salt quenching furnace as a separate item as a coagulant. Therefore, you can buy the coagulating material for competitive quenching salt baths and similarly add the new Holden Marquench #296, which will definitely eliminate your throwing away the quenching salt, and at the same time, obtain more uniform quenching.

Three f.o.b. points:

P. O. Box 1898
New Haven 8, Conn.

THE A. F. HOLDEN COMPANY
11300 Schaefer Highway, Detroit 27, Mich.

3311 E. Slauson Ave.
Los Angeles 58, Calif.

More For Your Money

HOLDEN SALT BATHS AND INDUSTRIAL POT FURNACES

Holden Type 701 Electrode Furnaces

. . . provide these Important Advantages

1. **Electrodes are completely separated** from the working area of the furnace. The brick structure is so designed that it is impossible for work to come into contact with electrodes, either in the basket or work holding fixture.

2. **Electrodes are easily replaceable.** The overhanging ledge permits repair or replacement without disturbing the refractory.

3. **No water cooling of the furnace wall** is required, so there is no power loss with this design.

4. **Split design electrode assembly**, an exclusive development of the Holden Company, provides 80% more area over which to carry secondary current.

5. **A 15 to 20% improved efficiency** is possible when this type electrode assembly plus the flexible braid for transmission of secondary power is used on competitive furnaces.

6. **A single bolt connection for water cooling** the electrode assemblies prevents oxidation of the copper to copper connection. Similarly with such water cooling of these terminals there is no possibility of inducing the heat from the furnace back to the transformer.

• SAVE ONE THIRD On Your Present Furnace

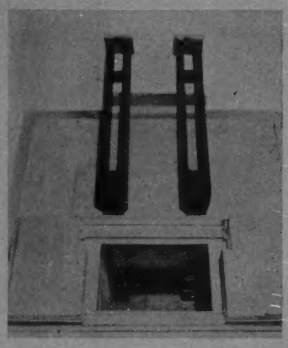
Any competitive furnace using the older type construction can be converted to this design with an electrical saving of approximately 33 1/3%.

INVESTIGATE THE HOLDEN LEASE PLAN

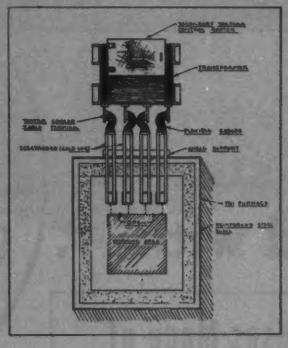
1. It will save you **one-third** over direct purchase and depreciation.
2. No capital investment required.

For full information, write or phone:

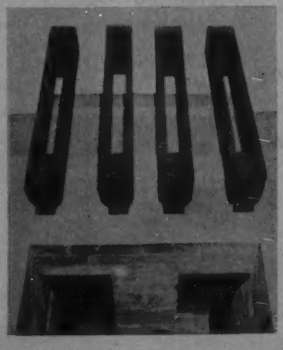
J. B. Carey, Detroit—Texas 4-8127
M. R. Boyle, New Haven—State 7-5885



HOLDEN TYPE 701-2
Submerged Electrode Unit with removable electrodes.



Drawing of HOLDEN TYPE 701-4
Submerged Electrode Furnace.



HOLDEN TYPE 701-4
Submerged Electrode Unit with replaceable electrodes.

THE A. F. HOLDEN COMPANY

THREE F.O.B. POINTS — LOS ANGELES, DETROIT and NEW HAVEN

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New Haven 8, Conn.

3311 E. Slauson Ave.
Los Angeles 58, Calif.

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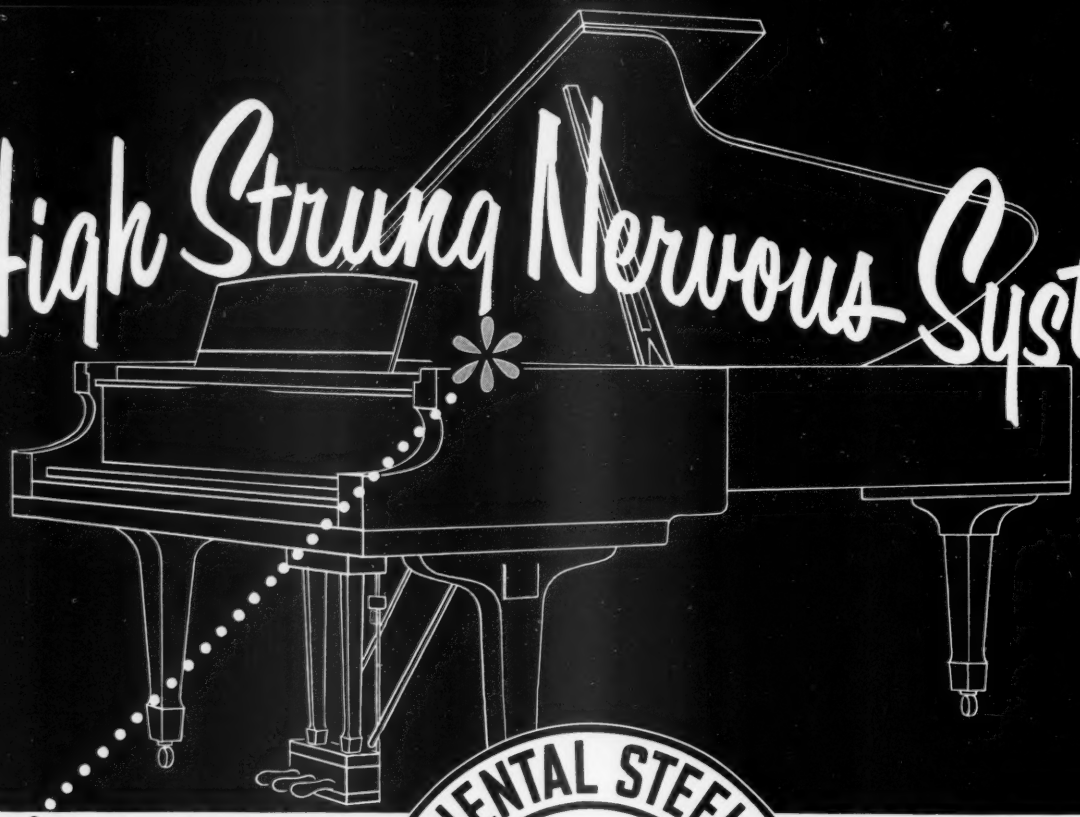
High Strung Nervous System



piano strings wound with . . .

CONTINENTAL STEEL CORP. STEEL CONTINENTAL WIRE REG. U.S. PAT. OFF. KOKOMO, IND.

FINE WIRE

Other Uses Made of CONTINENTAL Fine Wire

Matchbook Staples	Preformed Staples
Broom Binding Wire	Box Stapling Wire
Florist's Wire	Spiral Binding Wire
Tag Wire	Wire for Toy Wheels
Paper Clips	Common Pins
Automatic Pencil Lead Plungers	Yoke Winding for T.V. Picture Tubes

From the skilled hands of the concert pianist . . . to the opera singer's wire bound bouquet . . . Continental fine wire performs to the exact specifications for which it is designed. Continental fine wire quality and follow-through service is not just an established formula, but real application engineering. Every conceivable quality control . . . every case history, and every special order receives constant analysis. Continental specializes in wire for thousands of applications in practically any size, temper, finish, shape and analysis. Write or phone Continental at Kokomo, Indiana. Let's talk over your wire problems.

*Trade Mark Reg. U. S. Pat. Off.

CONTINENTAL STEEL

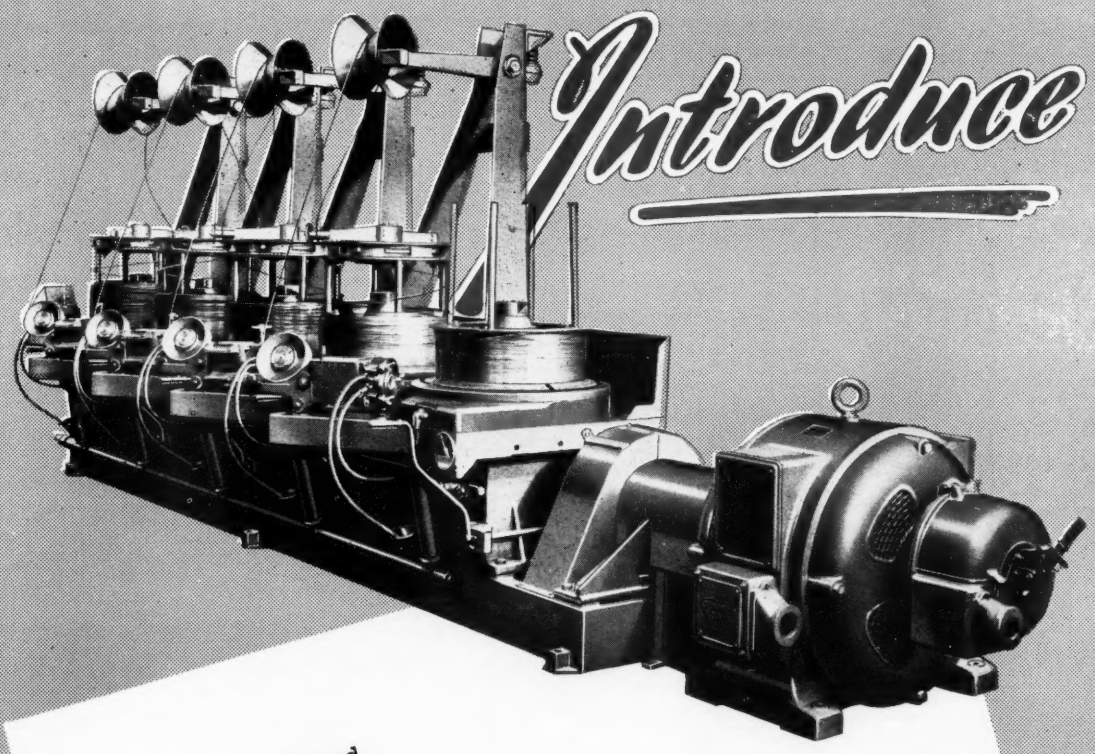
CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Manufacturer's Wire* in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

MARSHALL RICHARDS

Introduce



A new range of good quality, standard wire drawing machines for high carbon steel, mild steel and some other metals, at a reasonable price.

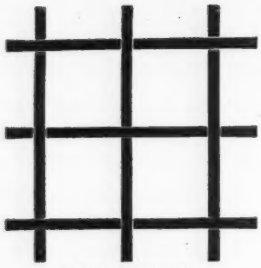
The design reverts to the well known method of driving such machines with a single motor but some improvements on normal machines of this kind are embodied. These improvements stem mostly from the great experience gained on the wide variety of wire drawing machines which we have installed all over the world. They are also the result of careful study of the fundamentals of this simplified design with a view to eliminating as far as possible, the disadvantages attendant on it.

You are invited to send for details of standard machines now being built.

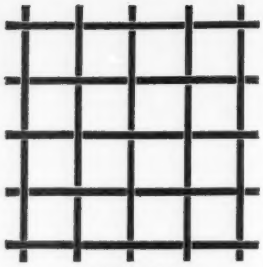
MARSHALL RICHARDS MACHINE CO. LTD.,

A MEMBER OF THE MARSHALL ORGANISATION

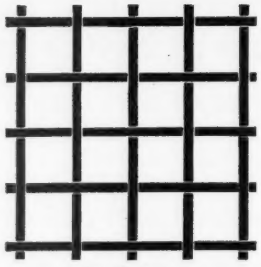
CROOK • COUNTY DURHAM • ENGLAND • Phone CROOK 272



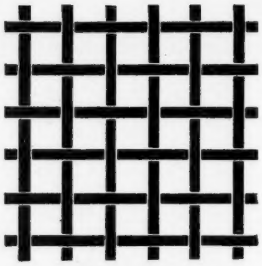
2 Mesh .063"
76.4% Open Area



3 Mesh .041"
76.7% Open Area

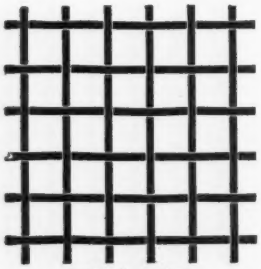


3 Mesh .054"
70.1% Open Area

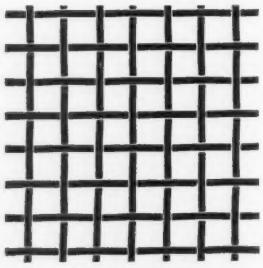


4 Mesh .063"
56.0% Open Area

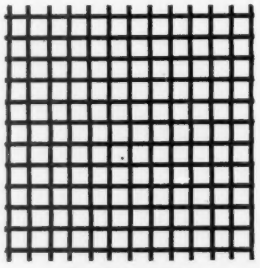
CALL CHASE



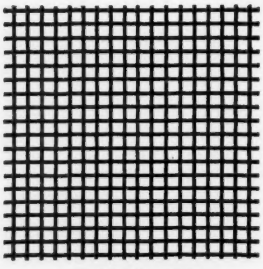
4 Mesh .047"
65.9% Open Area



5 Mesh .041"
63.2% Open Area

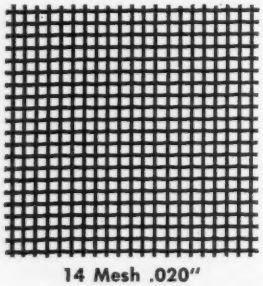


8 Mesh .028"
60.2% Open Area

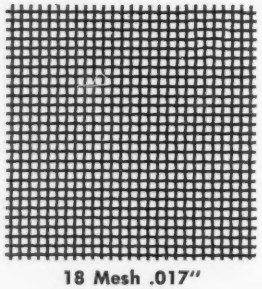


12 Mesh .023"
51.8% Open Area

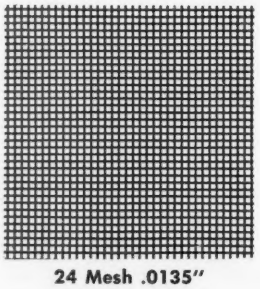
FOR INDUSTRIAL WIRE CLOTH



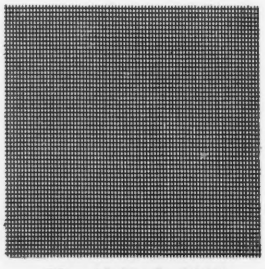
14 Mesh .020"
51.0% Open Area



18 Mesh .017"
48.3% Open Area



24 Mesh .0135"
45.8% Open Area



50 x 40 Mesh .009"
35.7% Open Area

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From coarse wire cloth for window or door grilles . . . right down to extra-fine mesh for food preparation, call Chase.

Double crimped wires of Chase Wire Cloth keep openings square and true . . . mesh uniform. It is woven in a mill which specializes in weaving brass, copper and copper-alloy wire cloth. The result is *quality*.

For information on the size and type wire cloth you need, send for free book or call your nearest Chase warehouse.

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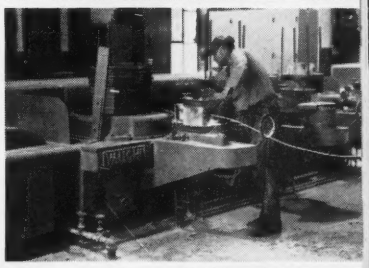
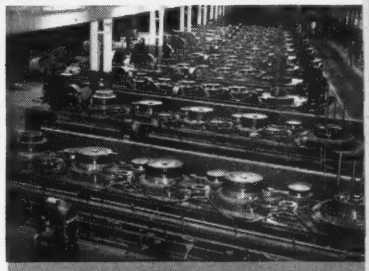
Efficiently serving one of America's largest producers of

STAINLESS WIRE





VAUGHN®

"Quick on the Draw!"

WIRE DRAWING MACHINERY

Many types of Vaughn Wire Drawing Machines serve ALLEGHENY LUDLUM STEEL CORPORATION in the stainless Wire department at Dunkirk, N.Y. In this exacting assignment, the outstanding Vaughn qualities of speed, endurance, versatility shine as bright as the product—year in and year out!

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COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

Here's the World's BEST Insurance for Insulated Wire Manufacturers!

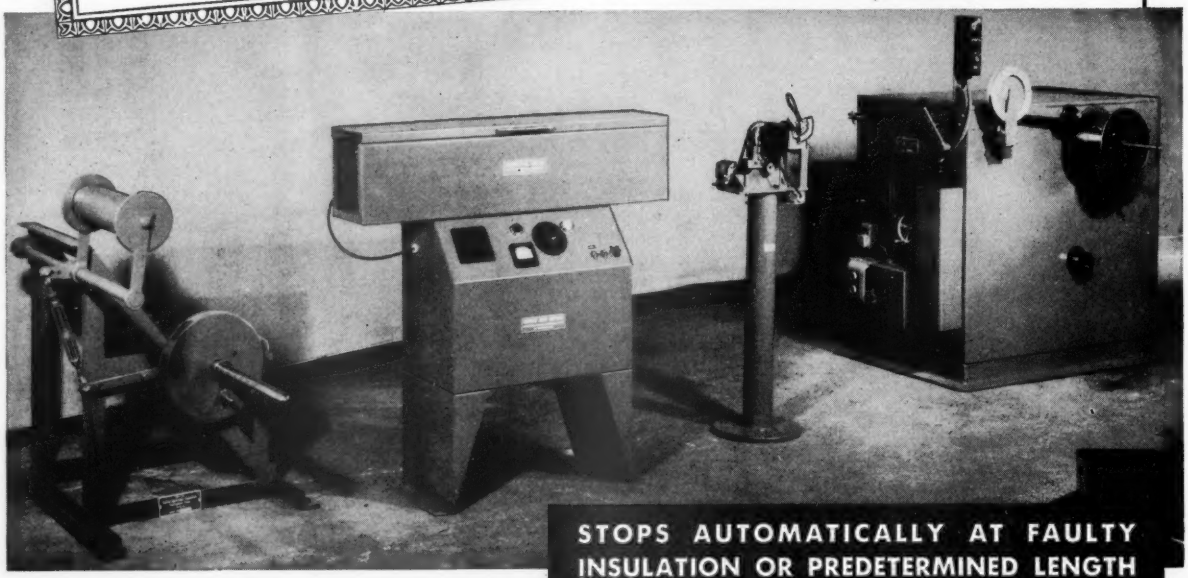
DAVIS

Automatic

SPARK-TESTING

Equipment

It insures against faulty wire insulation that causes customer problems.



STOPS AUTOMATICALLY AT FAULTY INSULATION OR PREDETERMINED LENGTH

DAVIS PAY-OFF (extreme left) automatically controls tension and braking, stops instantly when reeler or respooler shaft stops! Simply designed for left or right hand use . . . ruggedly built for lasting service. Shaft sizes: 1¼" or 1½"; for reels up to 30" diameter, 16" width.

DAVIS #4 SPARK-TESTER (left center) automatically stops at and locates insulation defects. It has a 36" stainless steel, bead chain electrode with maximum wire size of ¾" and wire speeds of 1200 fpm. Its volt-testing range is 1,000 to 15,000; up to 30,000 can also be supplied. Operates on 110 volts; other voltages obtainable. *Options:* footage can be increased by lengthening electrodes; electrodes available to accommodate up to 4" cable.

DAVIS WIRE MEASURING MACHINE (right center) with predetermined counter accurately measures wire footage. Counter is simple to set. At desired footage, its built-in switch shuts off power to reeler and respooler. Pedestal-mounted.

DAVIS REELER, RESPOOLER AND COILER is a versatile, variable speed unit with electrically or electronically controlled motor drive. Controls start machine with low torque to prevent wire stretching and/or breakage. Interchangeable shaft feature permits changing shafts in seconds. For reel diameters 6" to 30"; shaft diameters ⅝" to 1½". Constant footage device optional. Has electrical disk brake and safety cap for idler shaft. Easily accessible control synchronizes traverse variable speeds with spooling shaft speeds. Traverse width up to 16". Winding speed range: 10 to 1. Maximum wire speed: 1200 fpm. Unit adaptable for use with any type collapsible coiling head up to 30" diameter.

Accurate, dependable, easy-to-operate Davis products are available in complete assemblies as shown, or individually. Write for catalog bulletins and quotations on your requirements.

Davis ELECTRIC CO.

WALLINGFORD, CONN., U.S.A.

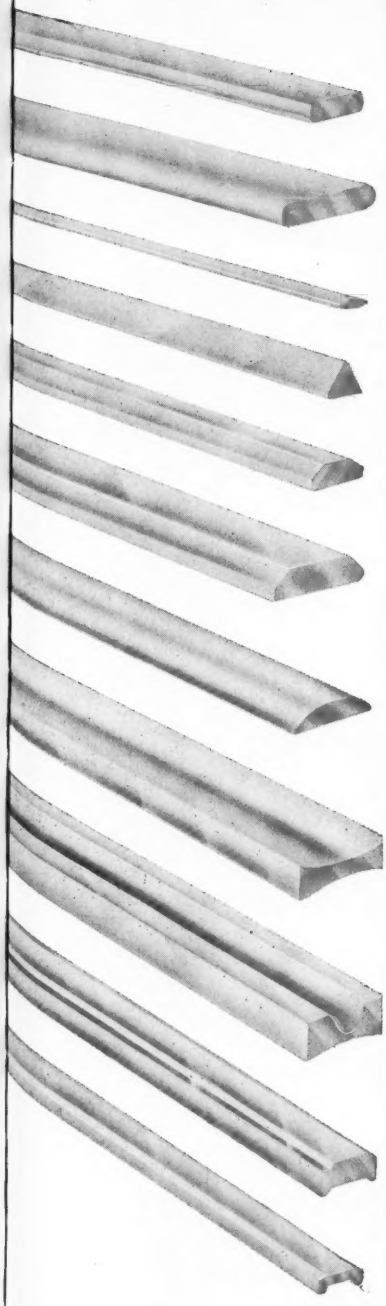
HARNESS TESTERS ★ PAY-OFFS ★ TRAVERSES

SPARK TESTERS ★ SPOOLERS ★ TAKE-UPS ★ CAPSTANS

Correspondents throughout the world

Foreign Sales Representatives: OMNI PRODUCTS CORP. 460—4th Avenue, New York 16, New York

DAVIS WIRE & CABLE EQUIPMENT



NATIONAL WIRE

(COLD ROLLED)

in Coils or Straight Lengths

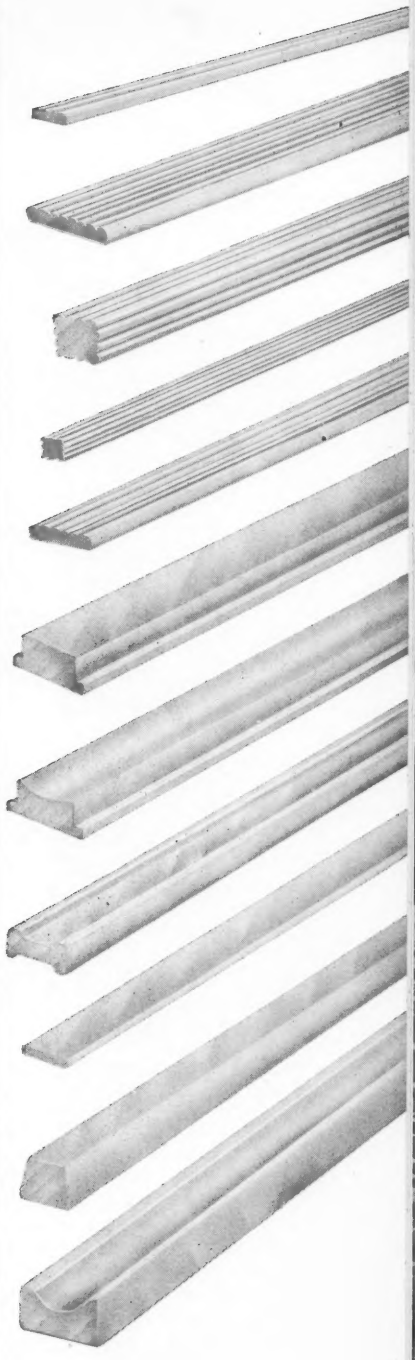
COMPLETE METALLURGICAL SERVICE

Manufacturers of

SPRING WASHERS	RETAINING RINGS
ROUND EDGE FLAT WIRE	KEYSTONE SHAPED WIRE
SQUARE EDGE FLAT WIRE	SPECIAL SHAPED WIRE

Shaped Wire in Coils or Straight Lengths, Ferrous or Non-Ferrous.

LARGE OR SMALL QUANTITIES



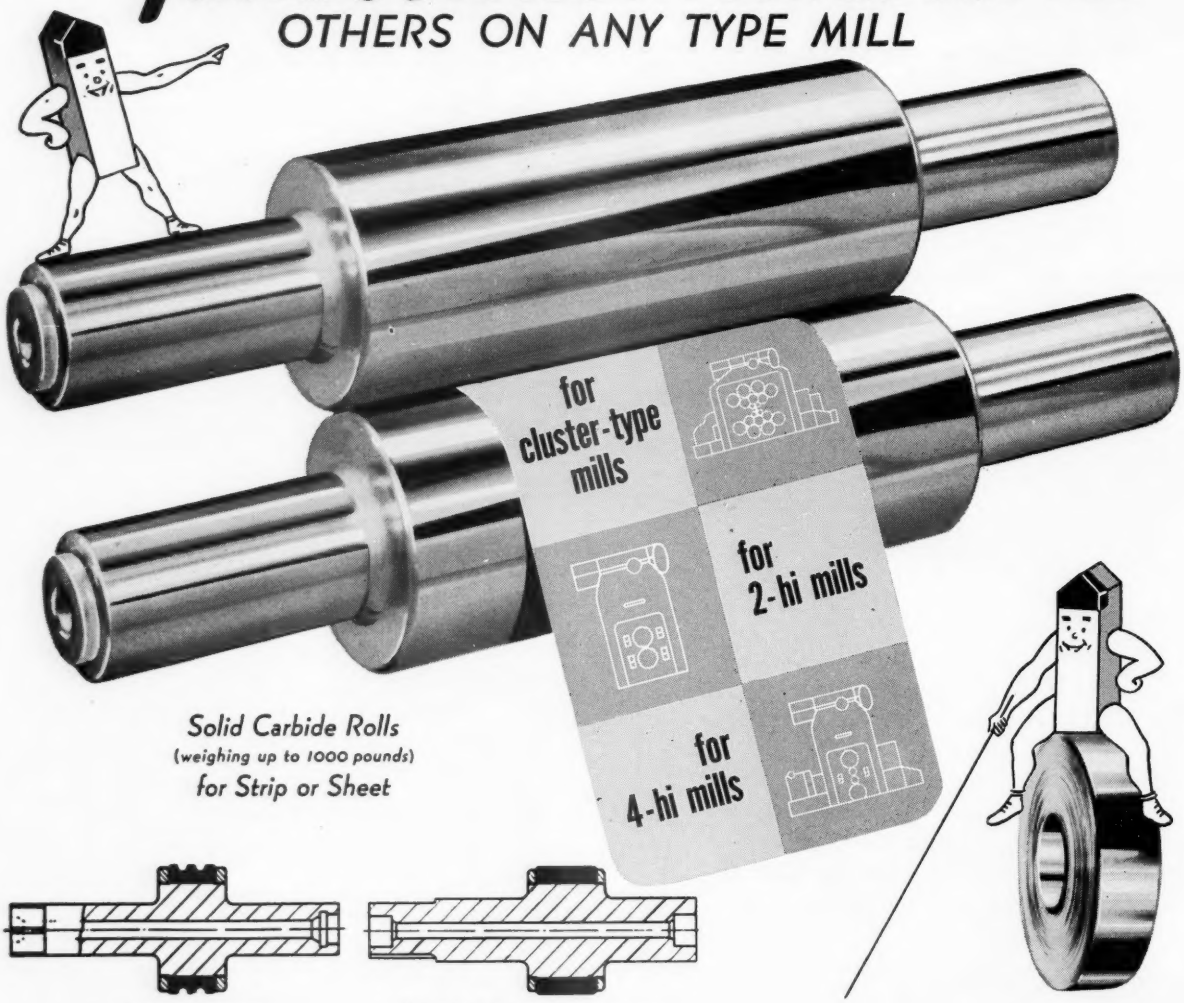
Manufactured by

THE NATIONAL LOCK WASHER COMPANY

PRECISION SHAPED WIRE DIVISION

NEWARK 5, N. J. MILWAUKEE 2, WIS. U.S.A.

Talide Rolls... OUTPERFORM ALL OTHERS ON ANY TYPE MILL



Solid Carbide Rolls
(weighing up to 1000 pounds)
for Strip or Sheet

FOR SHAPE WIRE

SLEEVED ROLLS FOR FLAT WIRE

Solid Talide Carbide Rolls are generally used for cold rolling carbon, alloy, spring, razor, silicon, stainless and other analyses of strip steel. They are being used satisfactorily as either idle or driven rolls. For cold rolling flat or shape wire from round wire, or when rolling metal tinsel or ribbon, a carbide sleeve is usually press fitted to a steel arbor. Talide Rolls can be produced in diameters up to 24" and lengths up to 40".

There are actually 14 specific advantages obtained in operation and product by using Talide (Tungsten Carbide) Rolls. Chiefly, Talide Rolls outlast steel rolls from 50 to 1 on low carbon steel to 15 to 1 on high alloys and stainless. You can make greater reductions per pass, operate at higher speeds and impart a smoother, brighter finish. Blanking die life is increased and plating costs reduced. Metal Carbides Corporation, Youngstown 7, Ohio.

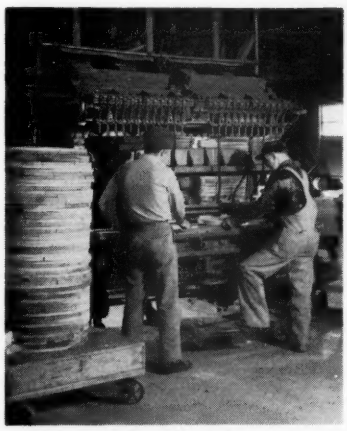
Ask for our
Talide Roll
Catalog CR-50

METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN 7, OHIO

SINTERED CARBIDES · HOT PRESSED CARBIDES
TUNGSTEN ALLOY HEAVY-METAL
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

REELS
for
SHIPPING · HANDLING · PROCESSING

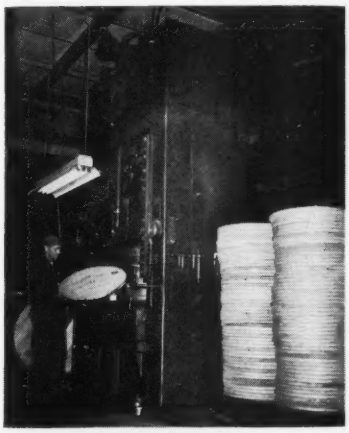
FOR ALL TYPES OF WIRE AND CABLE



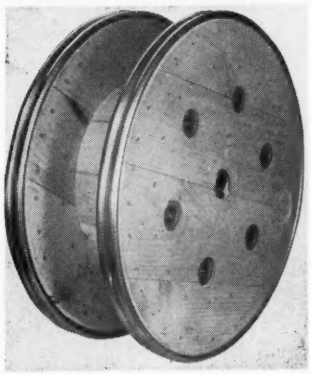
Nailing Operation

NAILED FLANGES—ALL SIZES. Flanges only or assembled as complete reel with stave or steel hub. Produced in our own completely equipped plant.

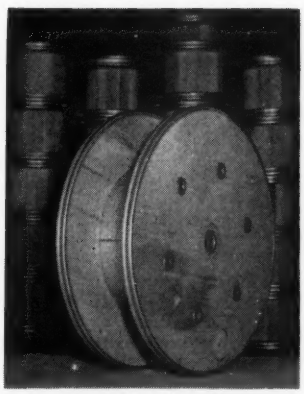
HUBBARD'S DIE FORMED STEEL TIRE. Adds life to reels, eliminates maintenance costs. Applied to nailed, dimension lumber or plywood flanges. Flanges only or assembled with stave, steel or aluminum hubs.



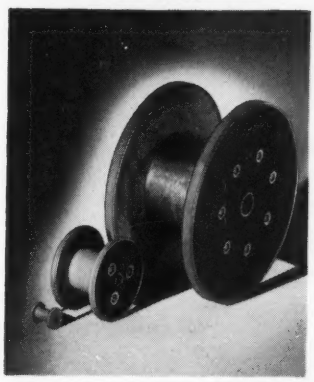
Banding Operation



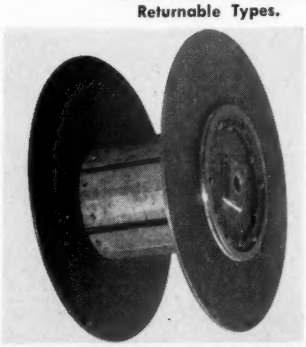
Nailed Reel. Banded for Returnable Types.



Dimension Lumber for Returnable Reels.

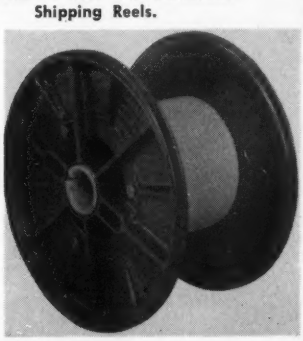


Plywood—Process and Returnable Shipping Reels.



Left: Special Reels Made to Your Designs

The HUBBARD line includes all types of spools and reels required for any shipping, shop or processing need.



Right: Light Alloy Cast Reels for Process & Shipping

HUBBARD SPOOL COMPANY

GARRETT • INDIANA

Telephone: 840

"THE BIGGEST NAME IN SPOOLS AND REELS"

For the FINEST Dies...

Specify

DIES... TOOLS... WEAR PARTS... BLANKS...

TELEPHONES: FACTORY and BRANCHES

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BIRMINGHAM, ALA. 4-0377	CLIFTON, N. J. PRescott 7-8610	INDIANAPOLIS, IND. WInthrop 2132	MINNEAPOLIS, MINN. HYland 9511	PORTLAND, ORE. ATwater 9641	SCRANTON, PA. Enterprise 1-0551
BOSTON, MASS. DEcatur 2-4456	DALLAS, TEXAS DIxon 4038	KANSAS CITY, MO. Baltimore 1700	MOLINE, ILL. Moline 2-3821	ROCHESTER, N. Y. LOcust 4882	SEATTLE, WASH. Seneca 5488
BUFFALO, N. Y. Bailey 4555	DENVER, COLO. Tabor 0444	LIGONIER, IND. 414	NEW YORK, N. Y. MUrray Hill 3-0291	ROCKFORD, ILL. Enterprise 2504	SYRACUSE, N. Y. Enterprise 9593
CHICAGO, ILL. NAtional 2-3434	DETROIT, MICH. UNiversity 4-6400	LOS ANGELES, CAL. LOgan 5-9811	ORISKANY, N. Y. Utica 6-1988	SAGINAW, MICH. 4-3384	WAUKEGAN, ILL. ONtario 2-5220
CINCINNATI, OHIO KIrby 2818	HARTFORD, CONN. 32-5197	LOUISVILLE, KY. Taylor 5960	PHILADELPHIA, PA. TEnnessee 9-5478	ST. LOUIS, MO. MIssion 0113	YORK, PA. Enterprise 9945

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The Wire Outlook

What will happen in business next year will depend pretty much on the attitude of the consuming public toward spending.

Other sources of demand have been slowly shrinking. Plant and equipment outlays will be 5 to 10 percent under 1953. Automobile production is expected to be down about 10 percent. Residential construction will be at a lower level. Up to this point government spending has been increasing, but is scheduled now for a slow tapering off over a long period.

Both savings deposits and savings bond sales are up, the latter by 15% over last year. There will be some 3 billion dollars more available for buying when income taxes are cut, so that the fate of the future becomes one of the psychological attitude of the ultimate consumer. If he draws in his horns and refuses to buy on a normal scale, a depression could be initiated. If he feels confident of the future and spends, business will go along on a fairly even keel.

For the first 9 months of 1953 personal incomes ran at a record 284 billion dollar rate, 6½% over the same period in 1952. A decline is being recorded in the final quarter of the year, stemming mainly from a drop in factory payrolls. This drop will affect both industry's and the Federal government's income, but it need not be serious provided the government reduces, not its purchases, but its outlays for foreign aid, bureau extravagances and over-heavy Federal civilian payrolls.

Actually the country is in a state of rapid expansion. Basic to this is our growth in population. 51,000 new consumers are being added to the country's markets each week, or some 2,650,000 persons annually. This rate is three times what it was 20 years ago. To meet the needs of these new consumers there will have to be more houses, schools, factories, water supplies, highways, stores and other facilities. The influence of this growth upon our future prosperity cannot be overlooked.

Steel production, we all know, has fallen to between 85 and 90% of capacity. Capacity, however, has increased in the last two years from 108 to 120 million tons, so that if this rate is maintained, we shall still be producing as much steel next year as we could have made in 1951, which would make 1954 our second best year.

Reversing a previous position, the National Labor Relations Board has sustained the right of an employer to lock out all employees after an illegal strike is started and to discharge all employees who failed to disavow the illegal strike. In the case in point, in violation of a no-strike contract, the employees on one shift walked out in an effort to force the company to grant a wage increase. This ruling, squelching union irresponsibility, is a healthy sign—one we have not seen for many years.

The buying of non-ferrous metals has picked up, probably due to the habit of ordering more than was needed in the period of shortages. As these surpluses have become exhausted, a more normal purchasing pattern has been resumed.

Volume is running heavier on high carbon specialties. Valve spring wire demand is slightly up and clock spring wire is reported active. Some pickup in merchant wire products is noted. There is plenty of capacity in most wire mills, however, to accommodate added business.

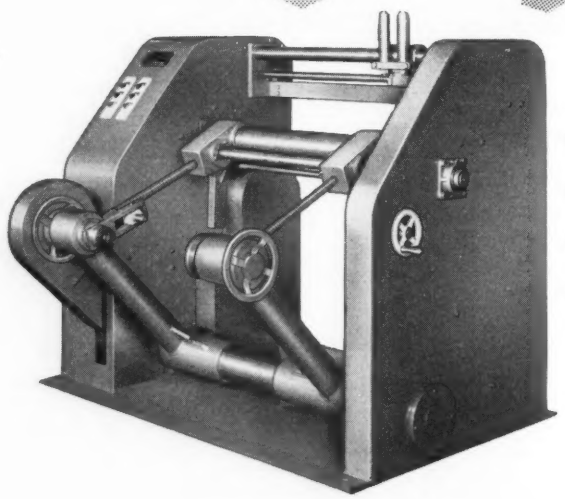
There will be no sharp break in prices in 1954. These are pegged by costs. Labor leaders are aiming at higher wages to maintain purchasing power, but the real question is: will labor produce more? Many prices could be lower and standards of living made higher were it not for work limitations imposed by union regulations.

The job of reclaiming the country from the devastating policies of the past 20 years is Herculean. Our President is under the fire of much criticism for conditions not of his making. If we want a free and prosperous economy, let's support the corrective measures.

—from the Editor's Desk

SHAFTLESS TAKE-UP

Eliminates the use of Reel Shafts



OUTSTANDING FEATURES

- Motor-driven reel lift with automatic stop with reel loading position.
- Handwheel adjustment with indicator for reel width adjustment.
- Traverse mechanism infinitely adjustable for traverse, lay and starting position.
- Hardened steel guide rolls adjustable to cable diameter.

Machine made in the following reel capacities.

Reel Dia. - - - - - - 24" Min. to 48" Max.
24" Min. to 50" Max.
30" Min. to 60" Max.
36" Min. to 72" Max.
36" Min. to 78" Max.
42" Min. to 84" Max.

Reel Width - - - - - - - - 48" Max.

Reel Weight - - - - 16,000 lbs. Max.

DESCRIPTION

The frame is of heavy fabricated steel construction of sufficient rigidity for the specified load and is mounted on a steel bed plate. The reel lift arms are of heavy steel tubular construction and are fulcrumed on a hollow steel sleeve. The reel pintles are mounted on anti-friction bearings and are moved into engagement with the reel arbor holes by means of a handwheel. Heavy roller-chain drive is fully guarded.

Reels are lifted by means of motor-driven screws. The reel raising and lowering motor is automatically controlled to lower to the reel diameter being used. Two sets of reel pintles are furnished to fit reel arbor holes as specified.

The take-up drive is available in various combinations to meet customer specifications. These may include:

1. Infinitely-variable drive, cable tension controlled.
2. Straight motor drive.
3. Adjustable constant-reel-shaft-speed.
4. External drive.

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See page 1329 for a complete listing of JLE Products for the Insulated and Bare Wire Industry.

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 28 DECEMBER, 1953 No. 12

Rod and Wire Quality vs. Cold Heading Quality

by William E. Hill, Jr.
Plant Superintendent
Russell, Burdsall & Ward Bolt and Nut Company
Rock Falls, Illinois

As business conditions change and every manufacturer becomes more and more cost-conscious, there is an ever-increasing need for better quality.

★ ★ ★

The drive for improved quality is intensified by and from the Consumer to the Manufacturer and by and from the Manufacturer to the Material Supplier or **vice versa.** Quality Control is one of the main factors in this drive, but we are in a transition period with Quality Control.

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Quality Control, with all of its ramifications, is or must become a "common sense" inspection, control, and acceptance with **mutual** agreement between Producer and Buyer as to Quality Acceptance Level or Rejection of whatever product is concerned. This must be done to protect both the Producer and the Buyer.

★ ★ ★

The Fastener Institute has developed a Quality Level for standard products as received by the Customer. However, there remains for us, as fastener manufacturers, our individual controls at various stages of manufacture.

A paper delivered at the Annual Convention of The Wire Association in Chicago on November 10, 1953. In it Mr. Hill points out the improper uses to which cold heading rods and wire may be put that can result in unsatisfactory products, in spite of a good quality of stock that is delivered by the wire mill, an appreciation of the characteristics of which can obviate certain pitfalls.

Mr. Hill spent two years at the University of Illinois and finished in 1942 at the Missouri School of Mines and Metallurgy with a degree of B.S. in Metallurgy. After spending some time with Columbia Steel Company and in the Navy, he joined his present company, where he has been for the past seven years.

William E. Hill, Jr.

★ ★ ★

For our purpose here, we will classify defects in the end product by two categories.

1. **Those caused by an inferior or faulty operation which may be remedied within the manufacturer's plant.**
2. **Those caused by inferior or defective material, namely, rods or wire. These defects cannot be remedied within the manufacturer's plant, but the effect may sometimes be alleviated so that the end product will meet required specifications. Alleviation is always done with an added cost. However, in the majority of instances, the product is sorted, diverted or scrapped at a much greater cost.**

★ ★ ★

Proceeding a step farther into the manufacturer's plant, it may be seen that oftentimes the defect found in the end product may be caused by either **the faulty shop operation** or by **the defective material** or **by both.** The direct cause or causes must be ascertained before eliminating, correcting or alleviating the condition. Let us observe a few of the defects and their causes.

Cracked Heads

a) Transverse or horizontal cracked heads are shown in Figures 1 through 5.

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Figures 1, 2 and 3 illustrate transverse cracks in varying degrees of severity in 5/8" diameter High Carbon Square Head Machine Bolts.

Fig. 1

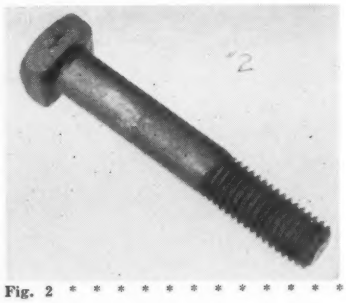

Fig. 2

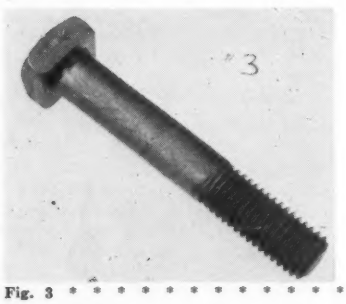

Fig. 3

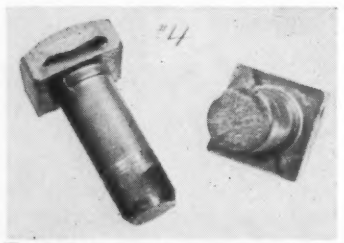

Fig. 4

Figure 4 shows a similar transverse crack in a 3/4" diameter Medium Carbon Square Head Machine Bolt.

Figure 5 shows a transverse crack which developed into a "teardown" on one corner of the head. This is a 5/16 diameter Medium Carbon Machine Bolt.

Fig. 5

Please note that all are similar in appearance.

Cause:

Figures 1, 2 and 3—A condition caused mainly by excessive segregation or poor grain structure in the C-1038 material. It is present in varying degrees of severity and is an intermittent condition found in most heats of C-1038 steel.

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It will vary from approximately 3/4% to 24% in the trimmed product. Annealing or stress-relieving of the material in various stages of manufacture prior to the trimming operation **will alleviate** this condition, but **will not eliminate;** it may, however, bring the defect as shown in Figure 1 down to a less severe one as shown in Figures 2 or 3.

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Figure 4—This bolt is shown in the "as trimmed" condition to purposely show the cause. This condition was produced by the trimming punch not bearing evenly on the underside of the untrimmed bolt as it entered the trimming die, thereby causing a tearing-out of one face. The underside view of the bolt shows where the punch was bearing unevenly.

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Figure 5—This condition was caused by two factors: 1) A porous heat of steel showing segregation and non-metallic inclusions and 2) a "fold" or "cold shut" produced from an improper bulb or "1st blow" on a double-stroke header. However, the poor condition of the material contributed directly to the improper flow of the metal into the bulb.

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A few other factors which may cause this type of defect are: Intermittent variations of wire size causing "cold-shuts," a greater-than-normal amount of stock in the head, misalignment of the face of the heading dies—preventing proper punch bearing on the underside of the head, poor "set-up" of the knock-out adjustment on the trimmer—not allowing the punch to work with the die.

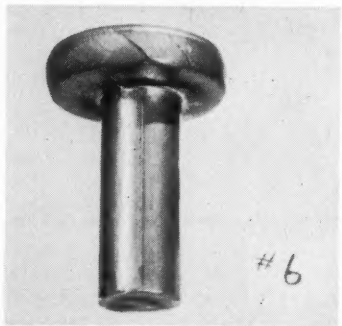

Fig. 6

Figure 6 illustrates compression cracks in the head, and are caused by material which is too hard for the amount of cold heading or working. The cracks ordinarily run at 45° angles and will oftentimes give transverse cracks in the head during trimming.

★ ★ ★

b) Vertical Cracks are caused by seamy or lapped material. Occasionally, the seams can be scaled off of the rod and wire. However, any seam deep enough to cause heading or trimming difficulty on standard product is too deep to scale off of the material prior to cold heading.

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Figures 7 and 8 illustrate two extreme cases of Vertical Cracks in both untrimmed and trimmed bolts.

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c) Miscellaneous Cracks are illustrated in Figures 9 through 12.

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Figures 9 and 10 represent two

types of recessed heads. Cracks are easily opened up from small or light seams. Any lapped or deep-seamed material can never be applied for these products.

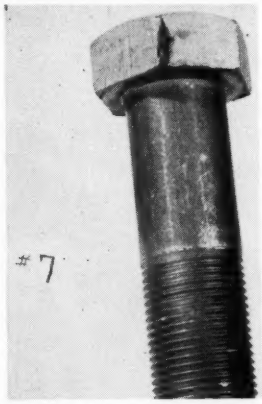

Fig. 7

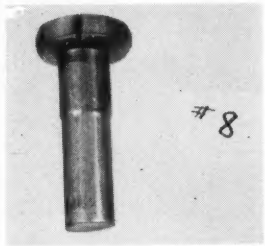

Fig. 8

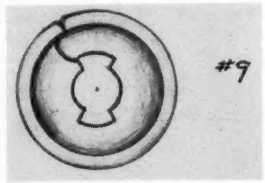

Fig. 9

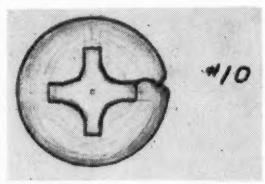

Fig. 10

Fig. 11

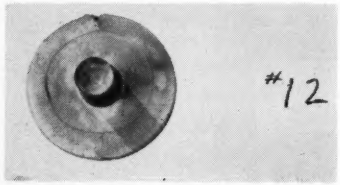

Fig. 12

If the material is **non-uniformly** soft, it will cause loss of control of the bulb and in turn will cause cracks originating at the point of the greatest stress.

★ ★ ★

Likewise, if the material is **uniformly** too hard, it will crack, and this crack will again originate from the point of greatest stress.

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Figures 11 and 12 illustrate cracks from design. Upsetting is within limits of the number of diameters, both for a Single Stroke product (Fig. 11) and for a Double Stroke product (Fig. 12). However, due to the large diameter of the head as compared to the diameter of the wire, accompanied by a minimum thickness of head, there is a tendency for cracks to appear around outside diameter of the head.

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Change of design, selection of analysis, annealing of material, and inspection of heats will help solve these problems.

Concentricity of Head Diameter

It is possible to have heads of bolts or rivets on center with the centerline of their shanks, but still have the outside diameter of the head out-of-round.

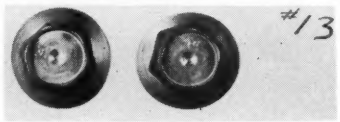

Fig. 13

Fig. 14

1) **Figures** 13 and 14 illustrate difficulties encountered from material as received.

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Figure 13 shows a Formed Hex Head Washer Face Bolt which average cold-heading quality material should make. However, the rod was approximately .030″ out-of-round (.025″ is the maximum allowed for cold-heading quality) and caused a hardness variation in the drawn wire, and in turn affected the flow of material into the head.

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Figure 14 shows, first, a head similar to that of Figure 13 and, secondly, the pattern of the material which caused the out-of-roundness. This inferior pattern accounted for the head out-of-roundness.

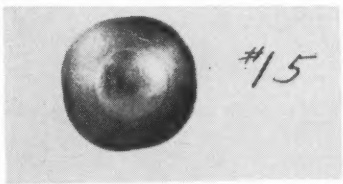

Fig. 15

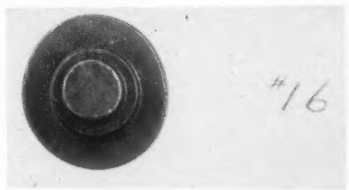

Fig. 16

2) **Figures** 15 and 16 illustrate difficulties caused in manufacturing.

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Figure 15 shows a bolt with almost a square instead of a round head. This was caused by a large and deep square under the head accentuated by a sub-standard bulb. Re-design of both bulb and product would eliminate this.

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Figure 16 shows a head with shallow areas on the outside diameter. This can be caused, once again, by extreme head diameter with minimum thickness, or by rough counterbores in the die and/or punch.

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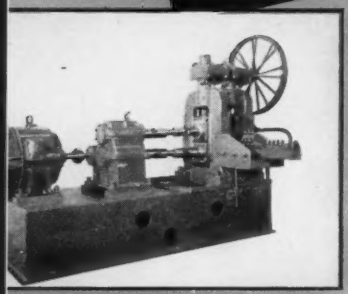
Another cause of head out-of-roundness occurs when the number of wire diameters to upset in the head is somewhat less than one (1) times. The cut-off operation during heading does not produce a square shear. The unevenness of shear may make the amount of stock (number of wire diameters) either greater or less than the amount required to pro-

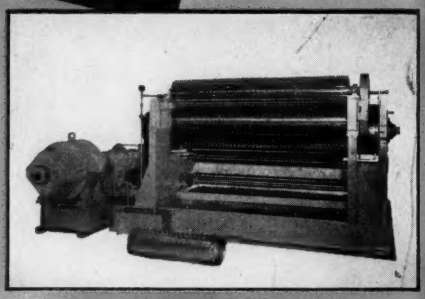
(*Continued on page* 1357)

LOOK TO Wean FOR WIRE MACHINERY

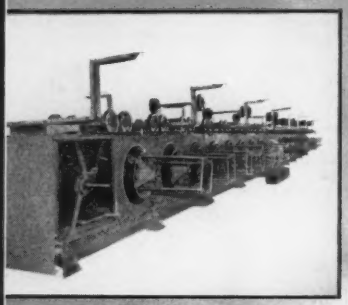
Process OR *Product*



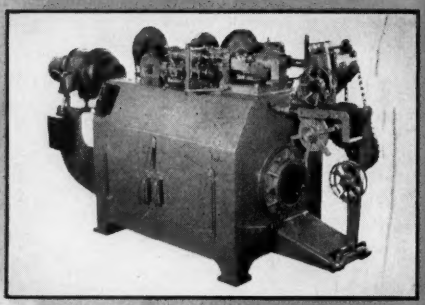
2—Hi Wire Flattening Mill



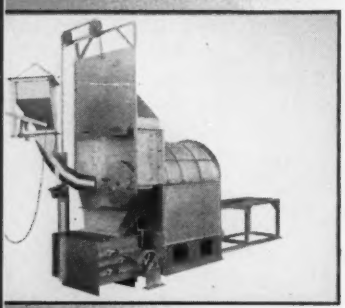
Hexagon Netting Machine



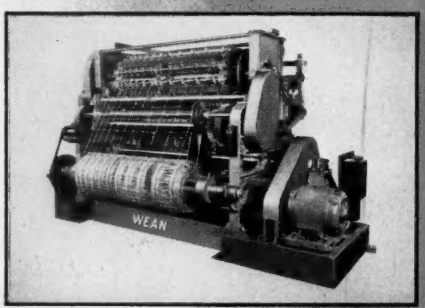
Wire Galvanizing Take-Up Frame



2 or 4—Point Barbed Wire Machine



Nail Galvanizing Unit



Hinge — Joint Fence Machine

In the past few years tremendous progress has been experienced in the field of wire machinery. Production speeds have been tripled and quadrupled. Product quality has been greatly improved. Machines have been made easier to operate and maintain.

The Wean Equipment Corporation has been a large contributor to this advancement. Wean wire mill specialists have designed, built, and installed wire mill equipment for the leading wire producers the world over. If you make wire you should look to Wean for the best in machinery, service, and facilities.

STRIP MACHINERY

Wean *Equipment Corporation*

CLEVELAND, OHIO

Electric Motors and Control for Slip Type Wire Drawing Machines

by H. A. Dickerson, Control Engineer
Westinghouse Electric Corporation
Buffalo, New York

Slip type wire drawing machines are not new in principle. They were manufactured and used in England as early as 1845. It took the introduction of the carbide die in 1926 to make the present day machines possible. These long life dies made the continuous drawing and spooling of welded lengths of wire on to high capacity spools for long periods of uninterrupted operation practical. The only way after that, to get more production from a given machine, was to increase drawing speed. This has resulted in drawing speeds, today, being up to ten or more times faster than they were before the carbide dies.

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High drawing speeds have created problems. Drawing machinery had to be improved and, electric drives with particular characteristics had to be developed. Today, electric drives with many features and functions are available. They can range from simple single motor schemes to complicated multi-motor units arranged for a special and precise, automatically coordinated operation.

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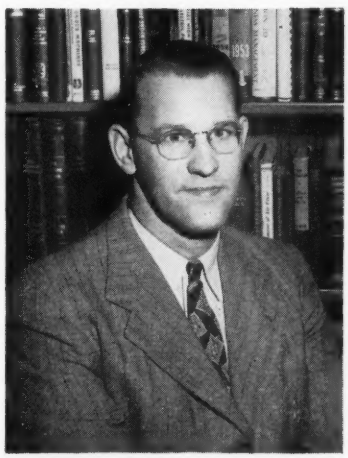
The most economic drive to apply on any application is the one that best satisfies machine and production requirements with a minimum initial and operating cost. Selection of a drawing machine drive requires an understanding of machine requirements in relation to drive performance and cost. The machine requirements depend on machine and spooler arrangement and the torque, power, and stored energy relations of the two. Drive performance depends on motor characteristics, limitations and control possibilities.

In this paper which was presented at the annual Convention of The Wire Association in Chicago on November 11, 1953, the author describes motors and controls that his company uses in its plant in the drawing of copper wire for electrical conductors.

Mr. Dickerson received a B.S.E.E. in 1939 from West Virginia University and joined Westinghouse in the same year as a Methods Engineer. From 1946 to 1949, after five years with the Army Engineer Corps, he was transferred to the Copper Wire Department. In 1952 was given B.S.M.E. degree by the University of Buffalo. Since 1952 he has been assigned to the Control Engineering Department as Application and Project Engineer.



H. A. Dickerson

Drive costs depend on the motor type, size, control required and the power supply available. The above factors will be discussed in the following.

Drawing Machine Torque, Power and Stored Energy Relations

The pull or effort required to draw wire through a die depends primarily on the percent reduction, the wire cross section and the wire material. Lubricant, die shape, die condition and work hardening of the wire also have some effect but need not be considered in this general discussion. Drawing effort or die pull, once movement starts, is for all practical purposes independent of speed and may be considered constant. Horsepower is a rate of doing work and is proportioned to die pull times drawing speed. Also since wire cross section times length is a volume, horsepower is proportional to percent reduction times the volume of wire passing through a die in a given time. All the dies in a slip machine normally have the same shape and percentage reduction, and since the same volume of wire passes through all dies, each die performs equal work on the wire. The drawing horsepower required for a slip type machine may, therefore, be considered as being proportional to the number of dies times the average die reduction times the finish wire cross section and speed. This, for a given wire size and number of dies in a machine, indicates that doubling the drawing speed doubles the drawing horsepower; and also, that if the wire area is halved the drawing speed may be doubled for the same total wire drawing work in a given time. The above relations are portrayed by the dotted curves of Fig. 1. Machine friction, however, is not a constant, but has components that are proportional to die pull and to the square of the speed. When speed and load friction torque are taken into account, the drawing speed for a given drive horsepower, usually cannot be quite doubled as wire area is halved. This relation is indicated by the solid curves of Fig. 1.

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Stored rotational or kinetic energy also has an effect on drive

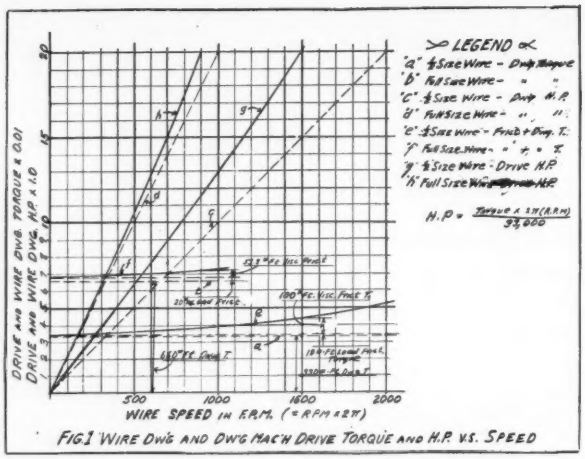

FIG. 1 WIRE DWG AND DWG MACH DRIVE TORQUE AND H.P. VS. SPEED

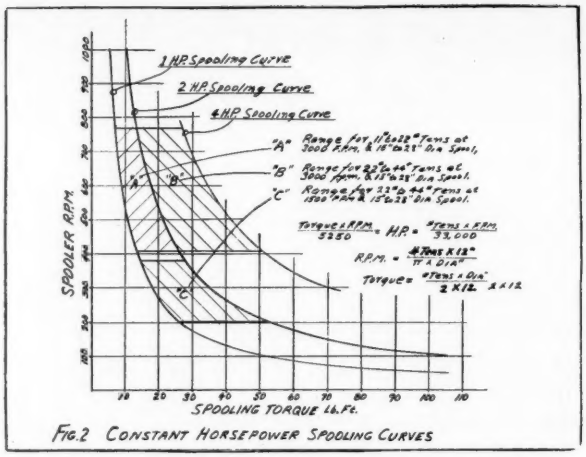

FIG. 2 CONSTANT HORSEPOWER SPOOLING CURVES

performance. During a starting period a machine drive must supply a torque or turning effort to overcome friction and die pull plus an additional amount to accelerate the machine to operating speed. This accelerating work is stored in the rotating parts of the machine as kinetic energy. On machine stopping it must be dissipated before machine movement can cease. On normal stopping, it is dissipated in friction and wire drawing work just as a nail in being driven through wood dissipates the kinetic energy of a hammer blow. On broken wire stops no wire drawing work is being done so the machine friction alone is left to absorb this energy. It will then take a much longer time for the machine to stop unless some kind of braking is applied. Kinetic energy is proportional to the square of the speed. If the speed of a given machine is tripled, the stored energy is increased by 3 x 3 or 9. If the weight of the machine moving parts is high this stored energy or flywheel effect, as it is often called, can be very large. This is usually the case in wire drawing machinery and must be taken into account when applying drive equipments.

Spooler Torque, Power and Stored Energy Relations

A spooler is required to take wire from a machine at some near constant tension and wind it on a spool. Since the wire speed and tension are constant, the spooling work or horsepower is also a constant. As the spool fills up the winding diameter increases and the spooler RPM decreases. Two constant horsepower spooling speed-torque curves are shown in Fig. 2.

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When a spooler is started, the drive must supply an extra component of torque over that required for friction and tension to accelerate the spool and spooling machine. A drawing machine drive on starting supplies torque first for overcoming friction and wire drawing work, and then any torque left over, is used for acceleration. A spooler drive, on the other hand, supplies torque first for friction, second for acceleration and finally any that is left over produces wire tension. The drive torque and acceleration rate must be closely controlled, if satisfactory tension is to be maintained. The acceleration rate is determined by the drawing machine. In the usual application the drawing machine acceleration is made as near uniform as possible so that a constant component of spooler accelerating torque or inertia compensation as it is sometimes called, can be used and still allow a near uniform winding tension. If the acceleration is not uniform the required accelerating torque will vary causing the spooling tension to vary also. Controls to vary inertia compensation to match a veriable accelerating rate are available, but they usually cost more than making machine acceleration uniform and are, therefore, not often used on winder drives.

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The stored energy of a spooler

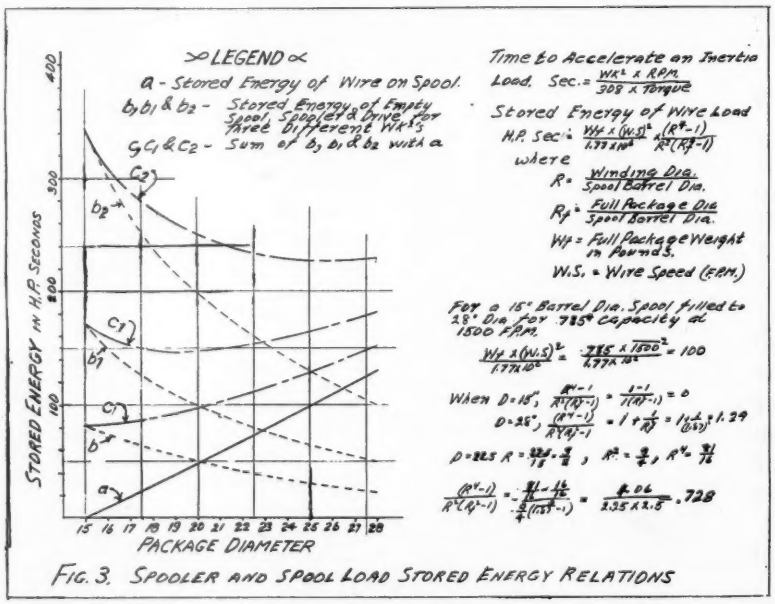

FIG. 3. SPOOLER AND SPOOL LOAD STORED ENERGY RELATIONS

varies. The kinetic energy of the spooler and spool decreases as the spooler slows down, but the kinetic energy in the wire on the spool increases. The net stored energy is the sum of the two. These relations are shown in Fig. 3. Curve "a" represents the stored energy of the wire on a 1.87 to 1 buildup ratio spool. Curves "b", "b1" and "b2" represent the energy of three different values of spool and spooler inertia. Curves "c", "c1" and "c2" represent the sums of "b", "b1", and "b2" with "a". Note the near level curve "c1" where the change in spool and spooler energy is equal to the total wire energy of a full spool. When this relation exists the same magnitude of inertia compensation would give a near uniform wire tension on stopping and starting partially filled spools if stopping and starting times are near equal.

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On stopping, the stored energy of a spooler must be dissipated. On machines with mechanically coupled spoolers it is transferred back to the machine by the mechanical coupling. On separate spoolers it must be absorbed by wire spooling work and some form of braking. If the stored energy is high, fast stops require high stopping torque. To avoid high spooler stopping torques, slow uniform machine stopping is sometimes a required function of drawing machine drives.

Motor Characteristics, Limitations and Control Possibilities

All motors are alike in that when voltage is applied they develop a higher than normal torque in an attempt to reach operating speed in the shortest possible time. Then, when speed is reached the torque drops to some lower value just sufficient to drive the load and maintain speed. The higher than normal starting torque in relation to percent operating speed during starting is different in different type motors. These relations are shown by curves where torque is plotted against speed and are called speed-torque curves. They may also be called response or characteristic curves and are used to determine motor or drive responses and calculate performance.

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The speed-torque curves of different motors vary according to motor type. Or in other words, the different type motors like all electrical and mechanical equipment, have different inherent characteristics. Often inherent characteristics can be fixed by design to suit particular drive requirements. In other cases controls are used to alter characteristic responses during certain periods. Here again motors differ. In some motors the characteristics are fixed and cannot be easily controlled; in others they are flexible and can be varied at will by the use of proper control equipment.

★ ★ ★

The following will illustrate motor characteristics and control possibilities. The common squirrel cage induction motor, although of limited suitability on wire drawing applications, serves as an easy starting point, and will be discussed first.

The Squirrel Cage Induction Motor

A cutaway of a squirrel cage induction motor is shown in Fig. 4. This motor consists essentially of a stator and rotor assembled in a frame with bearings to allow the rotor to turn. The stator winding is arranged in such a way that when a source of alternating current power is applied, a rotating magnetic field is caused to sweep around the circumference of the stator bore, and in effect sweep the rotor around with it. The rotor, or motor, speed of an inductor motor must necessarily be slightly less than the synchronous speed in order that a rotor current flow and torque be produced.

★ ★ ★

The difference between operating and synchronous speed is called slip. The slip over the normal operating range at rated speed is for all practical purposes directly proportional to load torque as is shown by the straight sections between points (1) to (2) of the curves in Fig. 5. These are

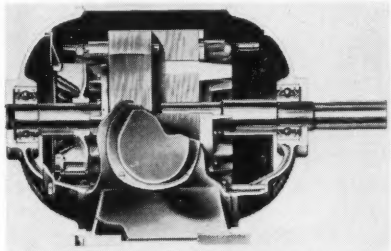

Fig. 4—Cut-away of Squirrel Cage Motor * *

typical speed-torque curves for three popular squirrel cage motors. Curve "B" is for a Nema Design B motor. Curve "C" is for a Nema

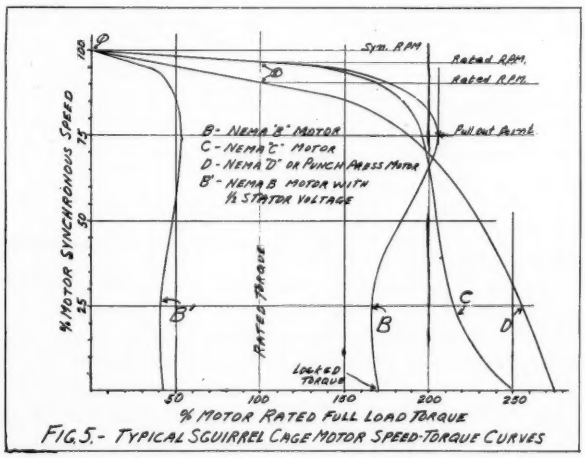
% MOTOR SYNCHRONOUS SPEED
SYN. RPM
Rated RPM.
Rated RPM.
Pull out Point
B - NEMA 'B' MOTOR
C - NEMA 'C' MOTOR
D - NEMA 'D' OR PUNCH PRESS MOTOR
B' - NEMA B MOTOR WITH ½ STATOR VOLTAGE
RATED TORQUE
LOCKED TORQUE
% MOTOR RATED FULL LOAD TORQUE

FIG. 5.- TYPICAL SQUIRREL CAGE MOTOR SPEED-TORQUE CURVES

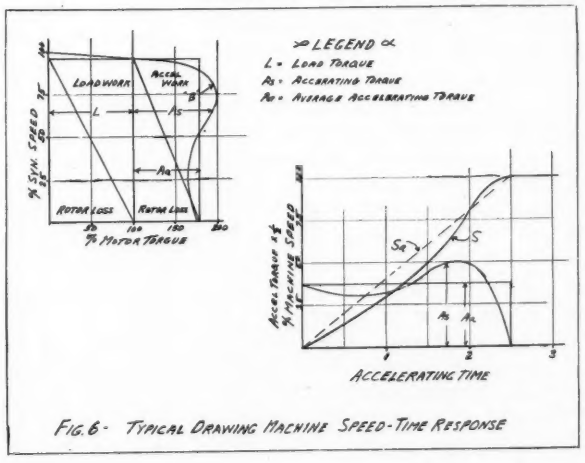

FIG. 6 - TYPICAL DRAWING MACHINE SPEED-TIME RESPONSE

C and "D" is for a high torque high slip Nema "D" motor. When a "B" design motor is used on a small drawing machine, the machine response during starting will be about as shown in Fig. 6. Note here the load torque, distance "L", and the accelerating torque, distance "As" on the motor speed torque curve "B". Since the load torque is constant the accelerating torque will vary with the response curve as the motor increases speed. This varying acceleration torque of the example will produce a varying speed-time response about as indicated by curve "s" of the time diagram. This speed response and hence the accelerating rate is not uniform as indicated by the deviation from the uniform or average speed change curve "Sa". Acceleration is proportional to "As", being equal at any instant to (As X 32.2)÷Wk² in radians per second. The torque response of a squirrel cage motor is always the same. Therefore, if the machine load is decreased more torque is available for acceleration. This means that total starting time and accelerating rate will vary as machine loading is changed. This effect can be troublesome on some wire machine drives.

★ ★ ★

Induction motor losses during a starting period are high. Neglecting the small iron losses, the total stator loss during starting is equal to the average starting torque times the synchronous field speed times the accelerating time. Or in other words, proportional to the total energy transferred across the air gap from the stator to the rotor by the synchronous field. The stator losses for the type B motor of our example, are about 175% of the normal stator full load loss. The serious losses of squirrel cage motors during starting periods are in the rotor. The rotor losses at any instant are equal to the slip, or difference between synchronous speed and rotor speed, times the torque. At the start the losses are equal to the torque times the synchronous speed, then as rotor speed increases the losses decrease until at operating speed, they reach a low value equal to running torque times the slip required to produce the running torque. The rotor losses over a starting period are, therefore, equal to the total work done by the rotor during the starting period. The distribution of rotor losses and work is pictured by the triangular sections under the speed torque curve of Fig. 6.

★ ★ ★

The total rotor loss relation of an induction motor during starting is given by the following equation:

(Average Motor Torque÷Average Accelerating Torque) X Stored Rotational Energy =Rotor Loss.

★ ★ ★

Since the average accelerating torque is (Average Motor Torque minus Friction and Drawing Torque) the rotor losses of motors with combination friction and inertia loads such as wire drawing machines increase rapidly as load torque is increased. This relation can be shown graphically by curves similar to the constant horsepower spooling curves of Fig. 2 where (Rotor loss) and (Accelerating Torque÷Total Torque) are the variables.

★ ★ ★

Under normal starting conditions the squirrel cage rotor of the type B motor has sufficient thermal capacity to not overheat during starting. Then when running speed and normal losses are reached, the excess starting losses are easily dissipated. However, if starting or jogging duty is severe, oversize motors often have to be applied to give additional thermal capacity to prevent the rotor from overheating. The less than normal torque during running then allows the rotor to cool off quickly.

★ ★ ★

Refer again to Fig. 5, the Class C motor, Curve "c", has the same full speed losses as the Class "B" motor. It also has a higher average starting torque and would accelerate the load of our example in a shorter time for less total rotor losses. However, this design rotor does not have as much thermal capacity as the B design rotor, and cannot be used for frequent starting or jogging of heavy loads. Also, in this case, the acceleration will not be as uniform as that of the "B" design. The curve "D" of Fig. 5 is also included for illustration. The D design motor is used on inertia loads such as flywheel punch presses and is not normally used for wire drawing machines. The running losses of this type motor are higher than those of the other two designs shown. The squirrel cage motor torque response is sometimes controlled by controlling the stator voltage. The torque is always proportional to the square of the voltage. For example, if the voltage is reduced by half the torque is reduced by four. The curve B_1 of Fig. 5 shows a half voltage response of the B design motor. Note that top speed is not affected, it being determined from the number of poles and the line frequency. Reduced voltage starting is sometimes employed on high inertia loads to reduce power demand on starting. It would be a disadvantage on inertia loads with high friction since it would increase starting time and total losses.

★ ★ ★

A procedure frequently employed to reduce starting losses on squirrel cage motors is to arrange the stator winding so it can be connected for two operating speeds with one speed being twice the other. Then, on starting, the motor is first energized for low speed operation and when the low speed is reached the connections are changed for high speed operation. Typical speed torque curves for a two speed constant torque type motor are shown in Fig. 7. These

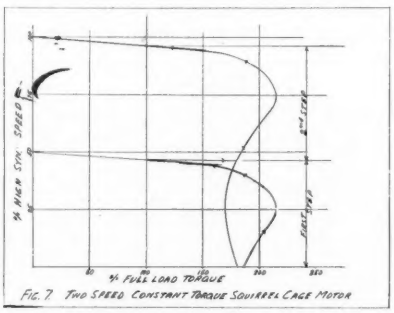

FIG. 7 TWO SPEED CONSTANT TORQUE SQUIRREL CAGE MOTOR

curves indicate that the average torque is about the same as that of single speed motor so that total starting time will be about equal. The average slip over the starting period will be halved so the total rotor losses will be halved. In

effect, the starting capacity of a two speed motor is twice that of a single speed motor for the same rating and top speed.

The Wound Rotor Induction Motor

The next, and more frequently used motor for drawing machine application, is the wound rotor induction motor. A cutaway of this motor is shown in Fig. 8. It has

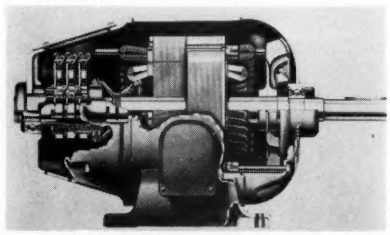

Fig. 8—Cut-away of Wound Rotor Induction Motor * * * * * * * * * *

the same kind of stator as the squirrel cage motor, but the rotor has an insulated wire winding similiar to that of the stator with the leads brought out to slip rings on the rotor shaft. In this way, resistence external to the rotor itself can be inserted in the rotor winding circuit.

★ ★ ★

This motor has two big advantages over the squirrel cage motor. First, by changing the value of external resistance, a family of speed torque curves is obtained as shown in Fig. 9. By first inserting resistance and then cutting it out in steps during a starting period the motor response can be arranged to travel progressively over a series of short sections of the curves as shown by the heavy lines. This will give a near uniform acceleration for a particular loading. Second, most of the rotor loss during starting appears in the external resistance and outside the motor where it can be dissipated easily without doing any harm. The advantages of the wound rotor motor are 1) greater flexibility of control and 2) increased starting and jogging capacity. Reduced stator voltage will also reduce the maximum torque response in the same way it does on the squirrel cage motor, so we now have two combinations of control; rotor resistance, and stator voltage.

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Full load operating speed, however, is still fixed at about 3% slip, unless we are willing to operate with permanent resistance in the rotor circuit and accept the high slip losses. For example, if we want a 4 horsepower output at 40% speed, the slip will be 100 —40 or 60% and the rotor loss will be (60÷40) X 4 or 6 horsepower. The total energy transferred across the airgap for this case will be at a rate of 6+4 or 10 horsepower. The motor, therefore, must use energy at a rate of 10 horsepower for a useful output of 4 horsepower. This for our example is only 40% power use efficiency.

★ ★ ★

The resistance of a wound rotor winding is low. In the example above, the rotor winding and resistor, or secondary loss as it is called, will be (100—40) or 60% of the total rotor power. The external resistors for the example above must be capable of dissipating 6(1.00—.03)=5.82 horsepower continuously.

★ ★ ★

At rated speed the stator and rotor winding and iron losses are dissipated easily. For 40% speed the cooling air flow established by the fan on the rotor shaft is reduced by approximately the square of the speed reduction and will be about 100÷(1.00÷.40)^2 or 16% of normal. Either some means of forced ventilation must be provided or the motor must be derated. If forced ventilation is not used about a 20 HP motor will be needed to dissipate the losses for the 10 HP work and resistor loss load.

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The above indicates that even though additional control flexibility is achieved by use of the wound rotor motor it is limited as far as efficient speed control is concerned.

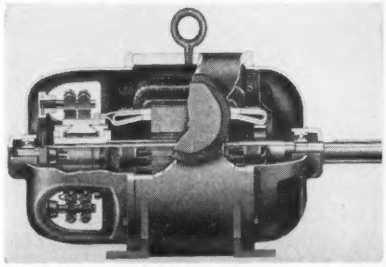

Fig. 10—Cut-away of Direct Current Motor * *

The Direct Current Motor

The direct current motor is the most flexible and versatile of all motors. Unlike the alternating current induction motor its top or

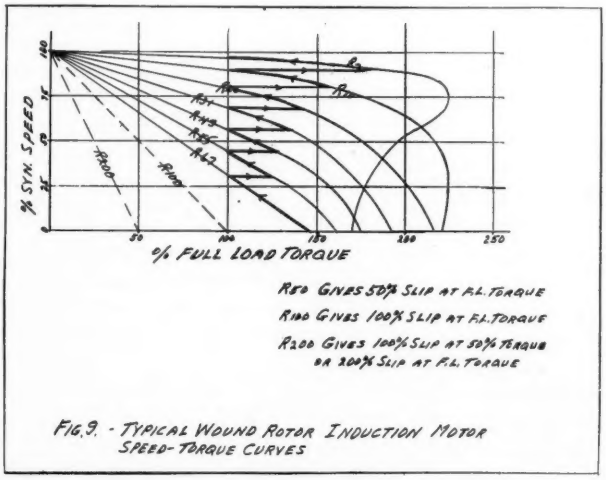

FIG. 9. - TYPICAL WOUND ROTOR INDUCTION MOTOR SPEED-TORQUE CURVES

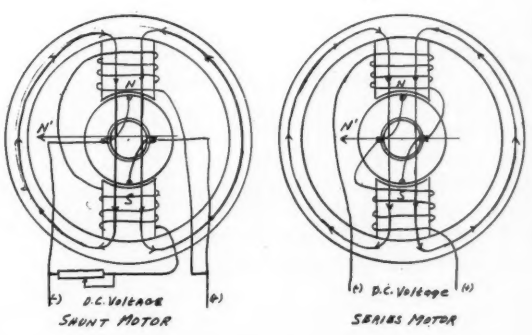

FIG 11 SERIES AND SHUNT WOUND D.C. MOTORS

operating speed is a function of voltage. If the voltage is halved for a given set of conditions, the operating speed is approximately halved without increasing the losses. Its construction is shown in the cutaway of Fig. 10. Its frame and general arrangement is similar to that of the wound rotor induction motor but its operating principles are entirely different. It has salient type poles fixed on the inside of the frame diameter and each pole normally has at least one or more independent and distinct windings enclosing all the pole iron. When these field windings, as they are called, are energized they magnetize the pole iron to set up a stationary or fixed magnetic field across the air gap, through the armature iron and around the motor frame as indicated in Fig. 11.

★ ★ ★

The armature of direct current machines have distributed windings in slots, similar to the rotor winding of the wound rotor induction motor, with the coil ends of each individual armature coil brought out and connected to a commutator. When a direct current is caused to flow through the armature coils, a magnetic field at right angles to the pole field is established. This armature field tries to line up with the pole field and causes the armature to turn. As movement starts the comutator bars move under the brushes to shift the armature current to a different section of the armature coils and thus keep the armature field at right angles to the pole field for a continued turning effort.

★ ★ ★

As the armature coils move past the pole flux a voltage is generated in them in a direction to oppose the voltage used to force current through the armature. When operating speed is reached, this generated voltage cancels enough of the applied voltage to allow the flow of only enough armature current to maintain motor speed.

★ ★ ★

If the applied armature voltage is varied, the motor speed varies nearly directly with it. If the field strength is varied, both the torque and generated counter voltage vary. For example, if the field strength is halved on a constant torque load with a fixed armature voltage, the counter voltage is halved. A much higher voltage is now effective to force a greatly increased armature current to flow. This causes the motor to increase torque until a higher speed is reached where the counter voltage can again maintain a stable relation with the applied voltage.

★ ★ ★

Direct current motor torque is proportional to field strength times armature current. The field strength in the example was halved, therefore, the armature current after the speed change has to be double its previous value to produce the same torque. With the speed doubled for a given torque the horsepower output is double. This principle is useful on wire machine drives. If a machine is drawing small wire at half load and slow speed, the field can be weakened to increase speed and utilize the available drive horsepower. This eliminates a gear change unit as would be required with the constant speed motors of alternating current drives.

☆ ☆ ☆

The direct current motor like any other electrical equipment is rated on the heat losses it can dissipate without exceeding safe temperature limits. At high speed its field current is decreased and causes less field heating. Also, the increased armature speed allows the armature losses to be dissipated easier. This, in general, results in direct current motors having higher horsepower ratings at maximum speed than at minimum or base speed. This increased high speed rating is effective in counteracting increased drawing machine friction losses at high speed to give a higher rate of production than is possible with alternating current motors and their fixed horsepower ratings.

★ ★ ★

If a direct current motor is operating at some speed and either the armature voltage is suddenly reduced or the field strength is suddenly increased, the generated counter voltage will, for a short time, exceed the applied voltage. The armature current and the torque will then reverse to quickly slow the motor down to a lower operating speed. The motor during this slowdown period acts as a generator and supplies power back to the line. This ability to generate power back into the line, or in some cases into fixed resistors after the power has been disconnected, can be used effectively to quickly slow down, or stop direct current machines. The first case, pumping back into the line, is known as regenerative braking, and the second case, pumping into a resistor, is known as dynamic braking.

★ ★ ★

The above should indicate that direct current motors and direct current generators are the same kind of machines and might be used interchangeably. This is true for machines with shunt pole coils or simply shunt machines.

★ ★ ★

This now brings us to field windings of which there are two principal types: 1) shunt and 2) series. See Fig. 11. A shunt field winding is energized by a flow of current independent of the current flowing in the armature circuit. The field current may come from the same source that supplies the armature or, it may come from some separate and independent supply such as a control device. Series fields are excited by the same current that flows in the armature. Series field strength is, therefore, a function of motor loading or the armature current flowing. The series field will give a motor response as shown by curve "Se" of Fig. 12. Motor response with the shunt fields will be about the same as the straight line response of induction motors but at different operating speeds depending on field strength as shown by the curves $Sh_{(f)}$ and $Sh_{(w)}$. The curves $Sh_{(f)}$ and $Sh_{(w)}$ are for a three to one speed range motor, however, motors with either higher or lower speed ranges can be had.

★ ★ ★

Direct current motor responses are also varied by resistance in the armature circuit. Resistance slopes

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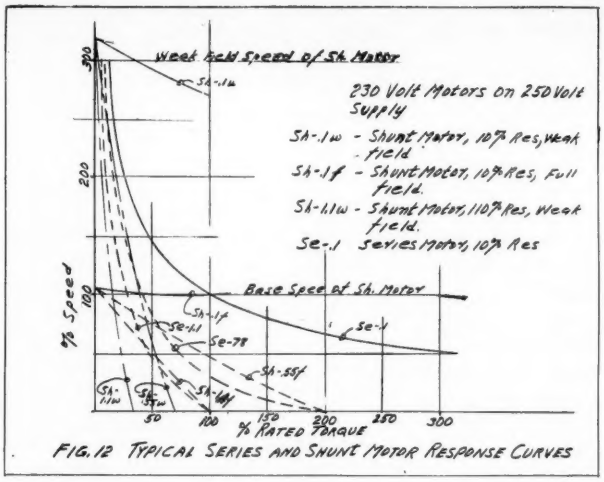
Weak field Speed of Sh. Motor
230 Volt Motors on 250 Volt Supply
SA-.1w - Shunt Motor, 10% Res, Weak field
SA-.1f - Shunt Motor, 10% Res, Full field.
SA-1.1w - Shunt Motor, 110% Res, Weak field.
Se-.1 Series Motor, 10% Res
Base Speed of Sh. Motor
% Speed
% Rated Torque

FIG. 12 TYPICAL SERIES AND SHUNT MOTOR RESPONSE CURVES

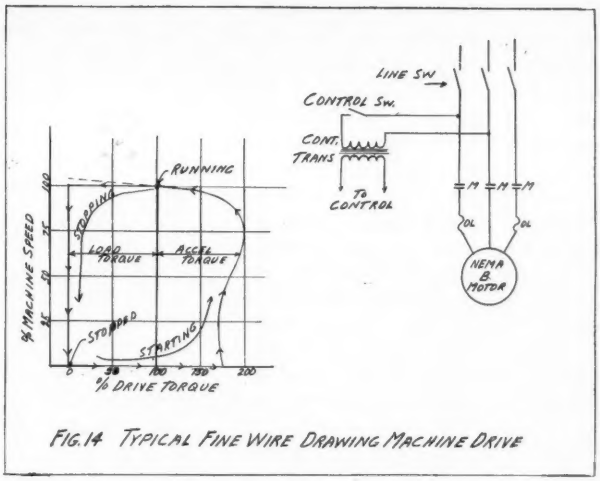

FIG. 14 TYPICAL FINE WIRE DRAWING MACHINE DRIVE

the shunt motor response as it does the wound rotor motor response; the higher the resistance the steeper the curve. The series motor torque is reduced by resistance. Typical series and shunt motor responses with series armature resistance are indicated by the broken line curves of Fig. 12. Composite response curves obtained by various combinations of shunt and series fields in a motor give responses exactly suited for most drive requirements.

★ ★ ★

When direct current motors are used on constant potential systems series armature resistance is used to limit torque and current as is done with wound rotor alternating current motors. However, when used on adjustable voltage systems, starting is accomplished by raising the generator voltage slowly to its operating value without the use of series resistors and their power losses.

★ ★ ★

The direct current machines get their flexibility and versatility in that voltage, resistance and field strength can be controlled independently, and, in that various combinations of field and voltage controls can be used to produce an almost unlimited variety of drive characteristics. In proper combinations and with suitable control direct current drives can fulfill the most complex machine requirements with a precision and efficiency obtainable in no other way.

★ ★ ★

The constant potential direct current drive with its starting resistors has accelerating losses during series resistance accelerating periods similar to those of the wound rotor drives. Its advantages over the wound rotor drives are 1) stepless shunt field speed control to eliminate gear change units and stepped speed changes 2) more control of characteristics to allow independent and more suitable responses during starting, running, stopping and so on. The disadvantages of the constant potential direct current drives is that direct current generating equipment will be needed if a direct current power supply is not already available. This entails extra cost. However, if more than one drawing machine is to be supplied, a single large generator installation can serve a number of machines. In installations of this sort and particularly where drive versatility for varied drawing machine loading is required, the increased and trouble-free production of direct current drives will usually pay for generating equipment in a short time. Also when electric power is purchased, synchronous motor generator sets can be used for power factor correction. Leading power factor synchronous motors can correct low power factor loads for more economical power costs and better utilization of shop feeder circuits.

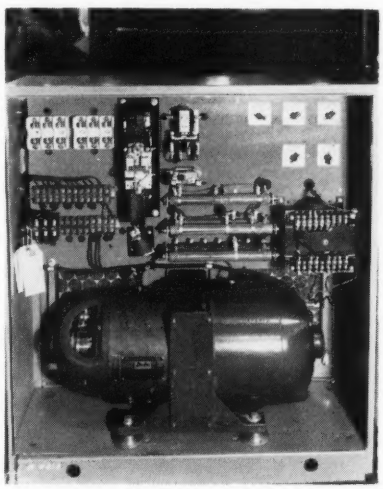

Fig. 13—Typical Packaged Adjustable Voltage Drive showing M-G Set and Control. * * *

★ ★ ★

Finally adjustable voltage direct current drives where the motors are powered by individual generators offer the ultimate in performance. In these drives the motor is connected directly to the generator. All control functions are accomplished by generator voltage and motor field control. That is, all control is by control of the relatively small generator and motor field currents. Large control panels, heavy contactors and power resistors are eliminated. The resulting panels are smaller, quieter and much easier maintained. Motor and generator characteristics can be designed to exactly suit each other and the machine requirements for the very best performance under all operating conditions. Motor generator sets with all control equipment factory wired and assembled in a self ventilated enclosure are available. On installation all that is required with these package drives after the unit is placed on the floor, is that the drive motor, the motor-generator power and the control leads be connected. The drive is then ready for service.

These drives normally use regenerative braking on all except emergency stops so no power other than normal losses is wasted. This, with the reduced control panel maintenance reduces operating costs and lost time. The reduced control costs and the ease and simplicity of installation reduce initial costs. And, the easily controlled and suitable drive performance assures maximum production under all conditions. These factors in general, will allow the direct current drives to be the most economical on all but the simplest applications. A typical small adjustable voltage direct current package unit is shown in Fig. 13.

Coarse and Fine Wire Drawing Machines with Integral Spoolers

These machines usually have from ten to sixteen die positions to produce and spool the coarse and fine wires at speeds ranging from about 4,000 to 6,000 or more feet per minute. The spoolers are driven from the drawing machines by various mechanical and hydraulic variable speed mechanisms. Usually the linkage is strong and rigid to transmit spooler starting and stopping torque. However, if the starting and stopping is too fast undue strains and slippage can be set up to cause excess wear and wire breakage.

★ ★ ★

The fine wire machines usually use small spools of about 4 to 8 pounds capacity. The stored rotational energy of the spooler is usually greater than that of the wire on the spool. The net effect is a decrease in stored energy as the spool builds up. This relation is shown in curve "C_2" of Fig. 3. Also the stored rotational energy of these drawing machines is usually high compared to the drawing torque, i.e., it takes about four to six seconds for the machine to coast to a stop when drawing wire. The running periods are relatively long, taking about four minutes per pound of wire or around 30 to 40 minutes to fill a spool. In general this means that about the following conditions exists:

1) **Starting time will not be affected much by changes in wire size.**
2) **Coasting to a stop will be slow enough and spooler stored energy small enough to not cause any excessive spooler stresses or wire troubles.**
3) **Running time will be long enough to allow dissipation of starting losses.**

★ ★ ★

A Type "B" squirrel cage induction motor will, therefore do a good job on a wire machine with the above requirements. All that is needed in the way of control is a combination linestarter with a disconnect switch and provisions for jogging and for interlocking with broken wire and full spool switches and any other coordination that may be required by the machine. See Fig. 14 for a typical squirrel cage motor fine wire drawing machine drive and response curve.

★ ★ ★

The coarse wire machines with integral spoolers are larger but similar in appearance to fine wire machines. They usually differ in drive requirements in the following respects:

1) **The wire drawing horsepower will be 4 to 10 times higher than that of the fine wire machines.**
2) **The machine stored rotational energy will increase about 2 to 3 times. The stored energy to drawing torque ratio will be lower and give about a two times faster stopping rate, probably 2 to 3 seconds.**
3) **The wire production rate will be higher, in the neighborhood of 2 to 4 pounds per minute at speeds from about 4000 to 6000 feet per minute.**
4) **Spools of about 80 to 100 pounds capacity will be used to give running periods of about 20 to 30 minutes.**
5) **The stored rotational energy of the spooler will usually be lower than that of the wire on the spool. A net increase in stored rotational energy will, therefore, occur as the spool fills up. This relation is shown by Curve "C" of Fig. 3.**

★ ★ ★

The above conditions will usually indicate about the following compared to the fine wire machine:

1) **Starting and jogging duty won't be quite so bad since the drawing load has increased more than inertia load to give a shorter starting time. The accelerating rate will probably be a little fast for good spooler operation during starting.**
2) **Stopping rate, especially when drawing the heavier wires, will be fast and will probably set up prohibitive spooler stresses. A longer stopping time will in all likelihood be desirable.**

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The above conditions indicate that something better than a "start-stop" squirrel cage motor drive is needed. Two suitable alternating current drive possibilities exist.

1) **Apply a flywheel to the machine or machine drive to increase starting and stopping time and use a two speed squirrel cage motor. This will improve starting considerably but a sufficiently long stopping time might require too much flywheel for the motor to accelerate easily. If this is the case add just enough flywheel for good starting and then on stopping, insert enough resistance in the motor primary to drop the drive torque to a value just less than the mimimum wire drawing torque. This will then give the slowest stops on the lightest wire and slightly faster stops on the heavier wire. The heavy wire tension being greater will absorb a little more of the spooler stored energy and help relieve spooler stresses on the faster heavy wire stops. If the wire size or drawing torque range is so great that increasing flywheel weight to the motor starting limit still won't allow satisfactory stops over the whole drawing range the primary resistor might be provided with taps. Then by means of a selector switch a reduced voltage torque to suit wire size changes could be picked. A schematic of the above drive is shown in Fig. 15. It would give good performance since most requirements will not be as rough as assumed above.**
2) **If a flywheel should not be practical and the two speed motor alone could not do a good job, a wound rotor motor would be indicated. By the use of 2 to 3 accelerating contactors, it would give a starting and stopping response about as indicated in Fig. 16. Also total starting and stopping time can be varied easily on installation to suit conditions. The added control ability and increased starting ability is a definite advantage on wire machine drives of the above type.**

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Control arrangement of the coarse wire machines is usually the same as those for fine wire. A "start-stop" pushbutton station, a jog button or rail and the necessary interlocking with broken wire and full spool switches is all that is required. The control panel and enclosure can be mounted at, or on, the machine. Some machines have the control mounted in cavities in the machine frame as standard machine tool procedure.

Intermediate to Heavy Slip Type Wire Drawing Machines with Separately Powered Spoolers

The intermediate to heavy wire drawing machines usually operate

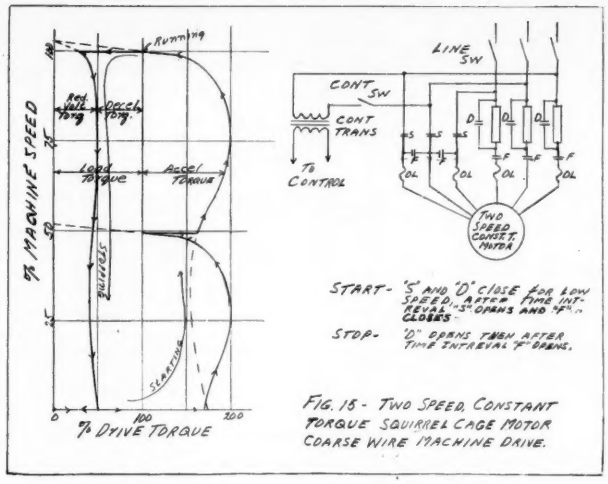

FIG. 15 - TWO SPEED, CONSTANT TORQUE SQUIRREL CAGE MOTOR COARSE WIRE MACHINE DRIVE.

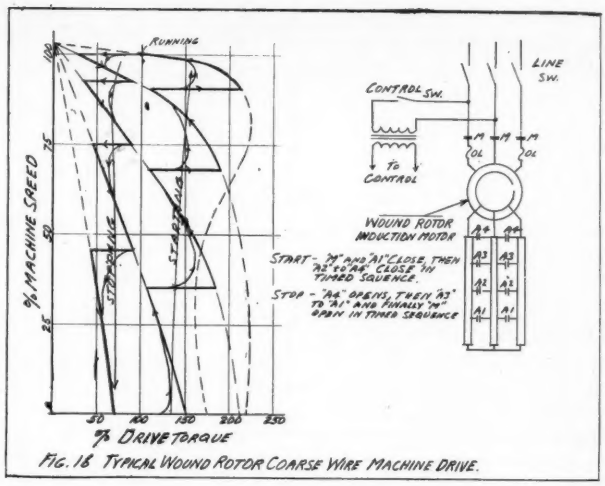
% MACHINE SPEED
% DRIVE TORQUE
RUNNING
STARTING
STOPPING
LINE SW.
CONTROL SW.
To CONTROL
WOUND ROTOR INDUCTION MOTOR
START - "M" AND "A1" CLOSE, THEN "A2" & "A3" CLOSE IN TIMED SQUENCE.
STOP - "A3" OPENS, THEN "A2" TO "A1" AND FINALLY "M" OPEN IN TIMED SEQUENCE

FIG. 16 TYPICAL WOUND ROTOR COARSE WIRE MACHINE DRIVE.

with separately powered spoolers. That is the spooler and the machine are driven by two separate drives with no mechanical connections between them. Various electric, hydraulic, mechanical and magnetic clutch schemes are used to these spoolers, or winders as they are sometimes called. They all have one thing in common. They are required to apply a definite tension to take wire from a machine and wind it on a spool. To do this during starting, stopping and running with no mechanical connection other than that afforded by the wire being spooled, is no easy trick. This is especially true when high capacity spools are operated at high speeds.

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The drives for these drawing machines range from about 50 to 250 horsepower and sometimes more. The wire sizes range from about #20—.032 to 4.0—.4600 wire. The speeds range from as high as 4,000 feet per minute for the smaller wires down to as little as 200 to 300 feet per minute for the large wires. In general the machine stored energy to drawing torque ratio even on the high speed machines is low giving fast stops that are adverse to practical spooler stopping times. The machine drives, therefore, except for some heavy wire and rod machines, usually have controls arranged to give as uniform as possible and relatively long starting and stopping times to accommodate the spooler drive in maintaining satisfactory tension.

Adding to the problem of achieving uniform acceleration and deceleration these machines usually supply breakdown wire for a bank of smaller machines as well as finish wire in its own size range. The drawing torque range, therefore is usually wide. Selected operating speeds to utilize available drive horsepower are usually required. On wound rotor A.C. drives with gear change units, near uniform drive loading on starting can be achieved to give uniform acceleration. Increased speed on light wire also increases the stored rotational energy to drawing torque ratio to help in giving the longer time uniform stops required.

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The controls of these switches are usually arranged to have the following functions and coordination with the spooler and the various safety and auxiliary devices.

1) **Jogging for Stringup**
One or more jog buttons or treadle rails located at the machine to do the following: When a jog button or treadle is depressed the machine is energized at a speed low enough for safe stringing. To not waste time the drive should run faster when the starting end with its slow speed capstans is being strung. Then as more blocks are strung the drive should slow down to allow a safe speed as the finish of the machine is reached. The above effect is accomplished on wound rotor and constant potential D.C. drives by the inherent regulation afforded by the starting resistors. Adjustable voltage D.C. drives have stiffer regulation and often use two jog controls, a high speed jog at the starting end and a lower speed jog at the finish end. Jogging control is normally arranged to be ineffective if snarl switches ahead of the machine or safety devices have operated. Machine jogging does not normally jog the spooler and is not affected by broken wire switches or full spool devices.

2) **Machine and Spooler Start**
Providing snarl switches or other safety devices are in their normal position and lubricant flow or oil pressure switches have operated, pushing the start button should do the following:
   a. **Bypass the broken wire switch to prevent it stopping the machine as long as the start button is held down.**
   b. **Release the spooler brake and energize the spooler to apply stall tension. Then after a short delay, start the machine and as machine movement starts, initiate spooler accelerating torque.**
   c. **Bring the machine up to a selected operating speed at a uniform rate and in a definite time so the spooler can maintain the required wire tension with a fixed accelerating torque.**
   d. **When operating speed is reached terminate the inertia signal to spooler to remove spooler drive accelerating torque and drop spooler torque back to the value selected for spooling tension during build-up.**

3) **Machine and Spooler Normal Stop**
When the normal stop pushbutton is operated or the full package device, if used, is operated, the control should do the following:
   a. **Start stopping the machine and just as deceleration starts initiate an inertia signal to the spooler to reduce or reverse spooler torque.**
   b. **Reduce machine speed at a uniform rate and in a definite time so the spooler can maintain the required wire tension with a fixed decrease or reversal of torque.**
   c. **When the machine is near stopped terminate the inertia signal to the spooler, apply the spooler brake, and de-energize**

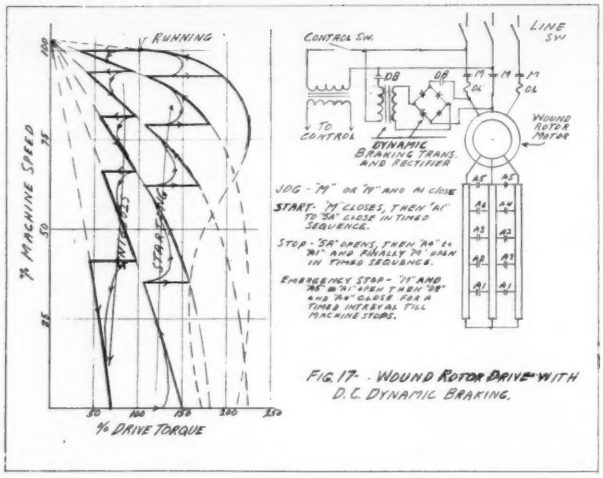
% MACHINE SPEED
% DRIVE TORQUE
RUNNING
STARTING
STOPPING
CONTROL SW.
LINE SW.
TO CONTROL
DYNAMIC BRAKING TRANS. AND RECTIFIER
WOUND ROTOR MOTOR
JOG - "M" OR "N" AND AI CLOSE
START - "M" CLOSES, THEN "AI" TO "3A" CLOSE IN TIMED SEQUENCE.
STOP - "3A" OPENS, THEN "AS" & "N" AND FINALLY "M" DRAW IN TIMED SEQUENCE.
EMERGENCY STOP - "S" AND "AS" OR "N" OPEN, THEN "DB" AND "3A" CLOSE FOR A TIMED INTERVAL TILL MACHINE STOPS.

FIG. 17 - WOUND ROTOR DRIVE WITH D.C. DYNAMIC BRAKING.

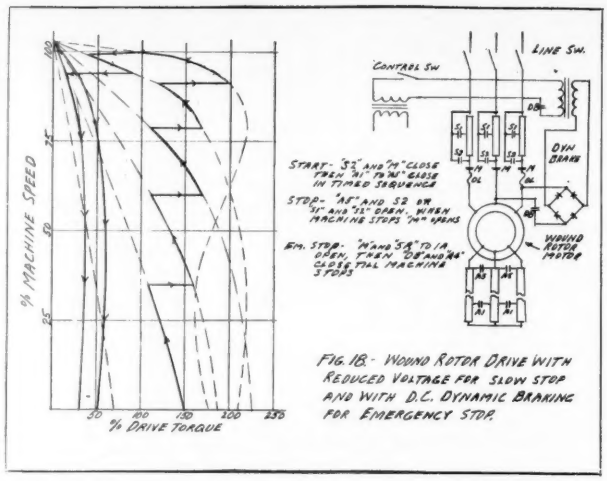
% MACHINE SPEED
% DRIVE TORQUE
LINE SW.
CONTROL SW
DYN BRAKE
WOUND ROTOR MOTOR
START - "3" AND "M" CLOSE THEN "N" TO "M" CLOSE IN TIMED SEQUENCE
STOP - "AS" AND 3 ON "S" AND "S1" OPEN. WHEN MACHINE STOPS "M" OPENS
EM. STOP - "M" AND "3A" TO 1A OPEN, THEN "DB" AND "3A" CLOSE TILL MACHINE STOPS

FIG. 18 - WOUND ROTOR DRIVE WITH REDUCED VOLTAGE FOR SLOW STOP AND WITH D.C. DYNAMIC BRAKING FOR EMERGENCY STOP.

the spooler. Then as the spooler is just about stopped de-energize the machine so the spooler will come to rest with or slightly ahead of the drawing machine to prevent wire breaks.

4) Machine and Spooler Emergency Stop

Operation of emergency stop push-buttons, snarl switch, broken wire switch, lubricant flow switch, oil pressure switch, machine and spooler overload relays or other safety devices should initiate the control to do the following: De-energize both the spooler and the machine and apply machine and spooler brakes to bring both the machine and the spooler to a complete stop in the shortest possible time within machine and spooler mechanical and drive limitations. The above stopping, since the machine can normally stop much faster than the spooler, except perhaps at near empty spool, will normally not prevent breaking wire. If feasible any of the less critical devices above can be placed in the normal stop circuit. However, devices that involve operator danger and machine or drive damage, should not be moved.

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The features and functions of the control outlined above are nearly ideal and will fit with all intermediate and large high speed machine requirements. Some large and heavy slow speed machines do not need so precise a control and drive. They offer no more application problem than the coarse wire machines with wound rotor drives and are easily handled.

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Three drives are used on the intermediate to large high speed machines. They are the wound rotor A.C., the constant potential D.C., and the adjustable voltage D.C. The wound rotor drive can handle the applications where extreme flexibility is not required The constant potential D.C. is next in suitability as requirements increase and finally, the adjustable voltage D.C. drive can best meet the most extreme drive requirements.

The Wound Rotor Drive

The wound rotor drawing machine drive on machines with separately powered spoolers can give uniform acceleration if drive loading can be kept near constant. This, on machines with a wire size range requires the use of gear change units imposed between the motor and the machine. When machine friction is taken into account, and depending on its increase at high speed, a speed change for each two to three wire sizes will be required, particularly if the drawing speed is high.

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Uniform deceleration will be a little harder to control since at high speed the ratio of stored rotational energy to drawing torque will be high for a relatively long stopping time. Since machine controls are not easily or quickly adjusted for different length stopping times the same setting will also be

(*Please turn to page* 1334)

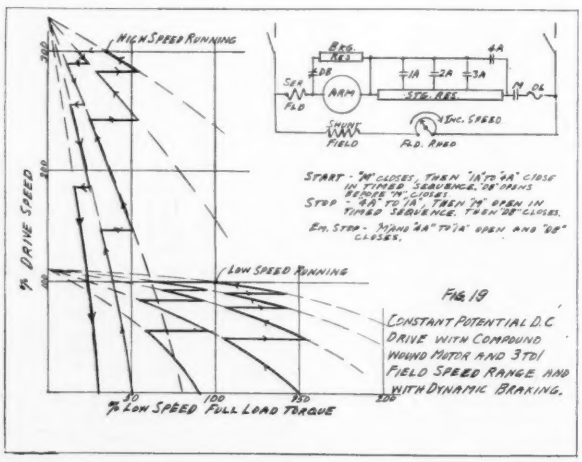
% DRIVE SPEED
% LOW SPEED FULL LOAD TORQUE
HIGH SPEED RUNNING
LOW SPEED RUNNING
START - "M" CLOSES, THEN "1A" TO "4A" CLOSE IN TIMED SEQUENCE. "DB" OPENS BEFORE "M" CLOSES
STOP - "4A" TO "1A", THEN "M" OPEN IN TIMED SEQUENCE. THEN "DB" CLOSES.
EM. STOP - "M" AND "4A" TO "1A" OPEN AND "DB" CLOSES.

FIG. 19 CONSTANT POTENTIAL D.C. DRIVE WITH COMPOUND WOUND MOTOR AND 3 TO 1 FIELD SPEED RANGE AND WITH DYNAMIC BRAKING.

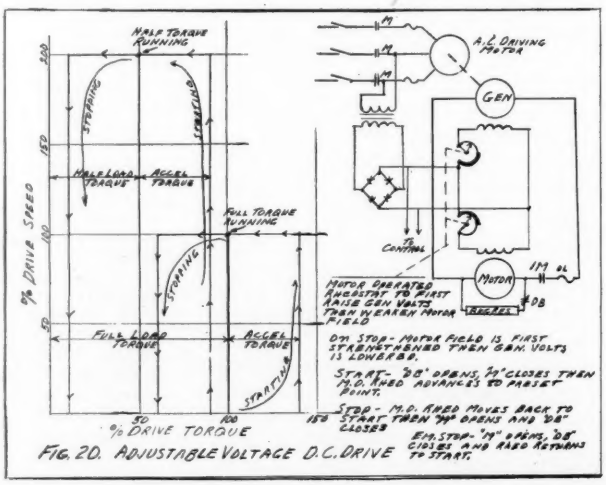
% DRIVE SPEED
% DRIVE TORQUE
HALF TORQUE RUNNING
FULL TORQUE RUNNING
HALF LOAD TORQUE
ACCEL TORQUE
FULL LOAD TORQUE
STARTING
STOPPING
A.C. DRIVING MOTOR
GEN
MOTOR
% CONTROL
DYN STOP - MOTOR FIELD IS FIRST STRENGTHENED THEN GEN. VOLTS IS LOWERED.
START - "DB" OPENS, "M" CLOSES THEN M.G. FIELD ADVANCES TO PRESET POINT.
STOP - M.G. FIELD MOVES BACK TO START THEN "M" OPENS AND "DB" CLOSES
EM. STOP - "M" OPENS, "DB" CLOSES AND FIELD RETURNS TO START.

FIG. 20. ADJUSTABLE VOLTAGE D.C. DRIVE

Continuous Annealing with Carbon Restoration of Coils and Bars

by J. D. Armour, Chief Metallurgist
Union Drawn Steel Division
Republic Steel Corporation
Massillon, Ohio

In this paper, presented in Chicago before the Annual Convention of The Wire Association on November 10, 1953 the author gives Republic Steel's methods of annealing with prepared atmospheres and of carbon restoration.

Mr. Armour received his technical training at the Carnegie Institute of Technology. Earlier in his career he spent some time with the American Steel and Wire Company and the Jones & Laughlin Steel Corporation. He joined the metallurgical department of the Union Drawn Steel Company in 1919 and was made chief metallurgist in 1922, a position he has occupied since this company became a division of the Republic Steel Corporation.

If you want to learn to swim, you can't wait until you know how to swim before you get into the water. There are a lot of cautious people who want to be sure just how every detail of a development is going to work before they try anything new, and perhaps we need that type of personality; but the majority of major improvements in industry have been made by people who were willing to jump into the water and learn to swim after they got in. We hear the comment "That guy was just lucky. He had no idea that this or that development would turn out so well when he first started it." It is true that there is an element of luck in many outstanding developments but in most cases the fellow was at least shooting in the general direction of the target he hit, as was Lew Worsham when he sunk his approach shot with the $25,000 tag on it at Tam O'Shanter last summer.

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When we started to work with furnace atmosphere at Republic, we didn't know just exactly what we were going to come up with, but we were fortunate in having a management willing to gamble that, if we didn't come up with a pearl necklace, we would at least come up with something to make the gamble worth while.

The Problem of Scale and Decarburization

One of our most annoying problems for years in the cold drawn wire and bar business had been the production of high carbon, carbon and alloy steels that required high temperature annealing. In our own plant this caused trouble due to scale which made pickling difficult and the finished product had a very poor surface compared with material that could be cold drawn without annealing. We also had to apologize to our customers for the amount of decarburization they found on the bars and explain to them that if they wanted an annealed structure that was best for machining, and the finished part had to be hard on the surface after their heat treatment, they would have to buy material 1/16″ or more oversize to get satisfactory parts. The loss of material in such cases ranged from 10% to 20%. This meant the customer's cost was increased by 10 or 20% of the invoice price of the material, plus his machining cost for removing the excess metal. Our only salvation lay in the fact that our competition couldn't do any better than we could.

J. D. Armour * * * * * *

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Before the development of furnace atmospheres, many experiments had been tried to reduce scaling and decarburization in annealing. These experiments included such things as burning green wood in the furnace chamber, placing pans of waste pickling liquor in the furnace, introducing natural gas under the cover of inner cover type furnaces, attempting to scale at a faster rate than decarburizing, pickling and liming the stock before annealing, and annealing in pipes sealed with fireclay. Figure 1 shows one of our old time furnaces with a charge of pipe annealing. We were rather proud of this setup at the time. The pipe annealing was fairly effective for preventing scaling at low temperatures, altho it was expensive due to the time consumed in loading and unloading the pipes. None of the other practices was very effective in reducing either scale or decarburization.

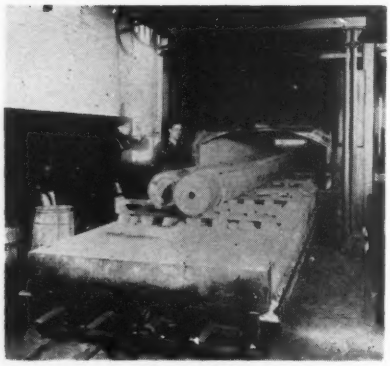

Fig. 1—Early method of controlling scale & decarburization.

Experiments with Furnace Atmospheres

At about this time gas generators were developed for making a prepared atmosphere from partially burned natural gas. The composition of this gas was about 5% CO_2, 10% CO, 10% H_2 and the balance N_2. The dew point would range from about 70°F. down to 40°F., depending upon whether the gas was water cooled or refrigerated to 40°F. The development of this type of gas was a great stride along the path of furnace atmospheres. It was very effective in preventing scaling during annealing but, to our great disappointment, it caused more severe decarburization than an open furnace atmosphere.

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As other types of atmosphere generators became available, we renewed our interest in the problem of decarburization. Some of the gases available were cracked ammonia, nitrogen, charcoal gas and gas for gas carburizing.

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Our first production annealing of medium and high carbon steel under atmosphere was carried out with charcoal gas. This gas is made by passing air over hot charcoal and the resulting gas is approximately 35% CO, 64% N_2 and 1% H_2.

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None of the furnace equipment we had at that time (1939) was adapted to the use of prepared atmosphere and it was necessary first to design and build a furnace suitable for annealing under prepared atmosphere.

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Figure 2 shows the furnace that was designed for this work. It is a cross between a sheet annealing cover and a conventional car type furnace. The radiant tube heated

Fig. 2—Car type furnace designed for application of prepared atmospheres.

cover is lifted by its own hoist instead of the usual sheet and strip practice of lifting the cover with a crane. The cover fits into a sand seal on the car. This construction eliminates the cold spot that is always found around the door of conventional car type furnaces. Heating tubes are also provided in the car bottom so that the charge is heated from the bottom as well as from the sides and top. The furnace is welded construction and is gas tight except for the atmosphere that leaks through the sand seal, so that no inner cover is required over the charge as is the conventional practice in strip and sheet annealing under atmosphere. This feature results in faster more uniform heating and it eliminates the problem of high inner-cover maintenance when using over-critical annealing treatments.

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When this furnace was put into operation in 1940 we had our first successful results in annealing at high temperatures without scaling or decarburizing. Annealing cycle time ran from 30 hours to as long as 100 hours. If the furnace atmosphere had been even slightly decarburizing, it would have shown up as quite deep decarburization because of the long time required for these cycles.

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Figure 3 shows SAE 52100 steel at 1000X annealed for about 100 hours in this furnace without decarburizing.

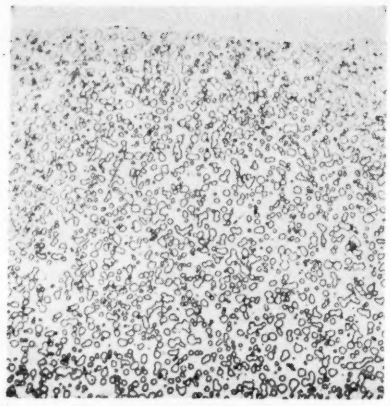

Fig. 3—SAE 52100 annealed without decarburization 1000X.

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While the results obtained with charcoal gas were satisfactory from the standpoint of freedom from scale and decarburization, there were several unsatisfactory features of the process. The direct cost (without maintenance) of making charcoal gas was about $1.00 per thousand cubic feet; the generator required a lot of attention to prevent channeling of the gas through the charcoal; maintenance cost of the carborundum muffle in the generator was high and skilled operators were required because it was necessary to maintain at all times the proper ratio of CO—CO_2 in the furnace atmosphere that would prevent decarburization and this ratio changed with the temperature during the heating and cooling of the charge. Figure 4 shows a chart prepared from the data on one of these charges. The heavy band on the chart shows the theoretical percent of CO_2 in a gas containing 35% CO that will not cause carburizing or decarburizing at a given temperature for the steel being annealed. It was the operator's job to keep the actual percent CO_2 as close to this theoretical band as possible by manipulating the flow gauges on the furnace. At lower temperatures it was necessary to actually add small amounts of CO_2 gas to maintain the proper ratio. How well the operator kept to the band in this instance is shown on the chart by the solid line.

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Because of these difficulties, it was decided to experiment with

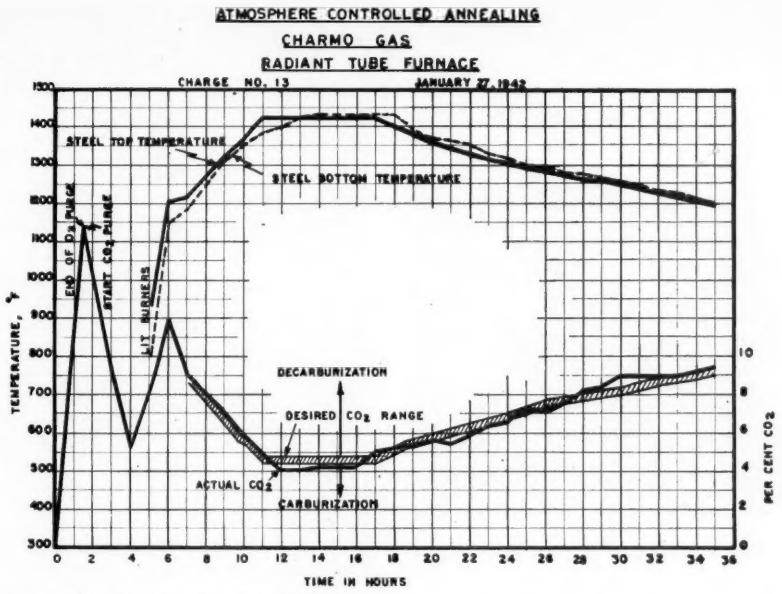

Fig. 4.

nitrogen gas, as by this time (1943) satisfactory nitrogen generators were being built. This gas is prepared by completely burning natural gas, extracting the CO_2 by passing through a solution of monoethanole amine and then drying the gas to minus 30°F. A typical analysis of this type of gas is CO_2 less than 0.2%, CO 1.5%, H_2 1.2% and N_2 97.1%.

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Our first attempt at annealing with this type atmosphere resulted in the work being badly decarburized. It was soon found that while the influent gas had a dew point of minus 30°F., the effluent gas from the furnace had a dew point of plus 30°F. or higher. It was mentioned earlier that this furnace did not have a metallic inner cover over the work and the furnace atmosphere was in direct contact with the refractory lining. The observed difference in dew point between the influent and effluent gases was attributed to the air and moisture that was occluded by the refractory lining of the furnace each time the furnace was opened for unloading and reloading. To correct this condition a small amount of natural gas (about 100 cu. feet per hour) was added to the nitrogen gas as it entered the furnace to promote the reaction—

$$CH_4 + H_2O = 3H_2 + CO$$

With this change in technique we were able not only to anneal without decarburizing but because of the excess of methane in the furnace atmosphere we were able to restore carbon to the decarburized surface of the hot rolled bars or wire. The carbon content of the surface is controlled by the dew point and maximum temperature used during annealing. The higher the maximum temperature, the higher the carbon content on the surface. The depth of penetration is controlled by the time at temperature.

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With the completion of this experimental development, we were in position to place a new product on the market — "Carbon Corrected" bars and wire. Many favorable applications were found at once for this product such as track pins, king pins, slide rails, distributor shafts, washing machine parts, refrigerator parts, pipe plugs, taps and many other parts. Particularly where induction hardening was used as the method of heat treating, carbon corrected bars showed to advantage. No surface removal was required to obtain maximum surface hardness and the service life of parts was greatly increased in many instances.

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Figures 5 and 6 show before and after carbon correction for an alloy steel AISI 5046.

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It was somewhat surprising to us, as well as to the customers interested in this product, that bars and coils could be satisfactorily carbon corrected without separating the bars or the strands of coils of the furnace charge. The bars were loaded in lifts weighing 8000 to 10,000 pounds and coils were loaded in stacks 30 inches high. Extensive testing showed that the carburizing gases had penetrated to all parts of the lift of bars and to all strands of the coils, but, what was even more convincing, the customer found he obtained uniform high surface hardness after his heat treatment of the finished part.

From Batch Type to Continuous Furnace for Carbon Correction

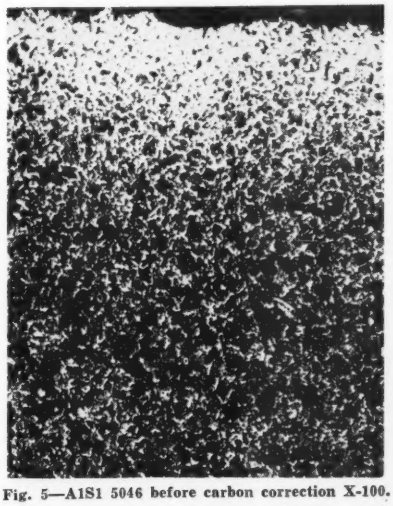

Fig. 5—A1S1 5046 before carbon correction X-100.

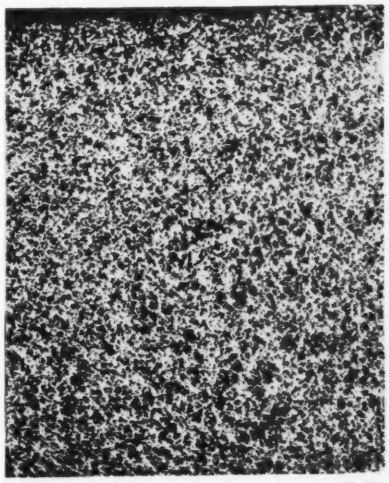

Fig. 6—A1S1 5046 after carbon correction X-100.

Shortly after the development of carbon corrected bars, we began to toy with the idea that it would be nice if we could carry out the carbon correction process in a continuous roller hearth furnace, as this would overcome some of the objections to batch type annealing. With batch type annealing, the bars, especially in smaller sizes, would become so crooked that they presented problems in the subsequent operations of pickling and drawing. Also, when the charge did not extend to the ends of the furnace, there was a tendency to overheat the ends of the bars. This resulted in heavier carbon correction on the ends of the bars and the laboratory would report that the ends were "loaded."

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To design a continuous furnace with both ends open at all times and yet maintain an atmosphere inside the furnace that was free of oxygen was not a simple matter. Continuous carburizing furnaces have been in use for years, but these furnaces are provided with closed vestibules which prevent oxygen from the air getting into the furnace proper. The use of closed vestibules was not practicable in our case as the bar stock we annealed was 35 feet long and it would have been necessary to have a closed vestibule on each end of the furnace over 35 feet. The design, as finally worked out, provided for a floating bung on the charge and discharge end that could be adjusted so as to just clear the load on the roller hearth. This resulted in a very restricted opening at each end of the furnace. We further provided a very large volume of atmosphere for the furnace (8500 cu. ft. per hour of atmosphere for a furnace having a cubical content of 1000 cu. ft.). All of this atmosphere had to escape through the restricted opening around the charge at both ends of the furnace. To further prevent air currents from entering the open ends of the furnace, air curtains were provided over each door.

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The atmosphere for this furnace is (1) 5000 cubic feet of nitrogen introduced one half in each end; (2) 3600 cubic feet of cracked air gas mixture (CO—20%, H_2—40%, N_2—40%) and (3) a small amount of natural gas. The cracked air gas and natural gas are introduced in the middle of the furnace.

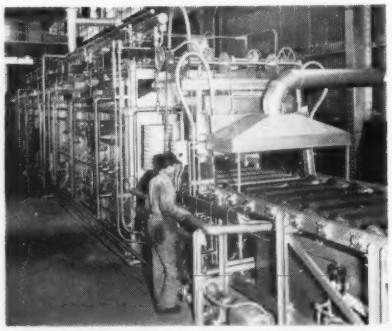

Fig. 7—Continuous furnace for carbon correction.

This continuous furnace, shown in Figure 7, gave excellent results in carbon correction from the first. It is divided into six zones which can be operated at different temperatures, so that alloy or carbon bars can be isothermal annealed while they are being carbon corrected if desired. This furnace proved ideal for such "fussy" jobs as induction hardened piston pins made from carbon corrected AISI C-1050 steel.

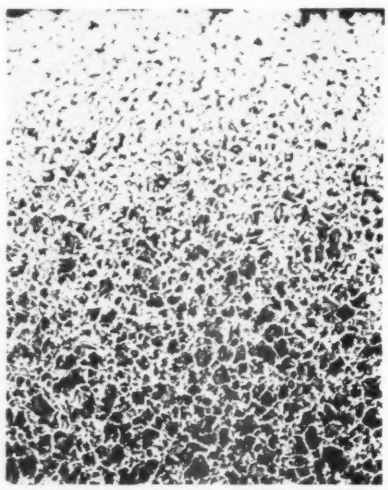

Fig. 8—A-131 1050 before carbon correction X-100. * * * * * * * * *

Figure 8 shows the surface of a bar of AISI C-1050 before carbon correction and Figure 9 shows the same bar after the carbon correction process.

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Figures 10 and 11 show carbon corrected isothermal annealed AISI 81B-45 at 100X and 1000X.

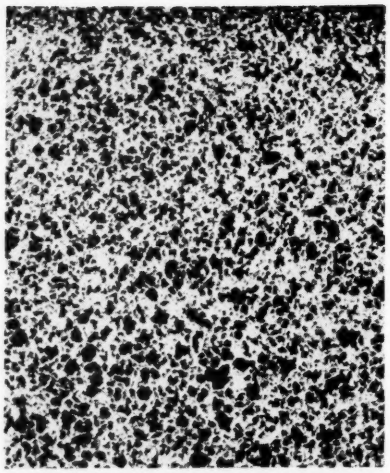

Fig. 9—A1S1 1050 after carbon correction X-100.

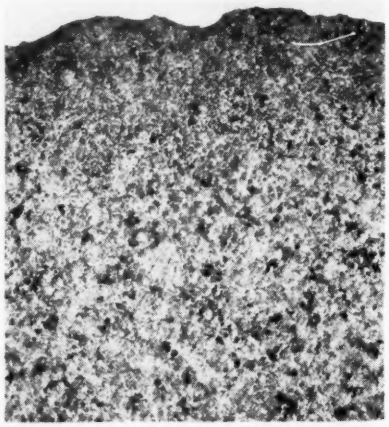

Fig. 10—A1S1 81B45 carbon corrected and isothermal annealed. X-100. * * * * *

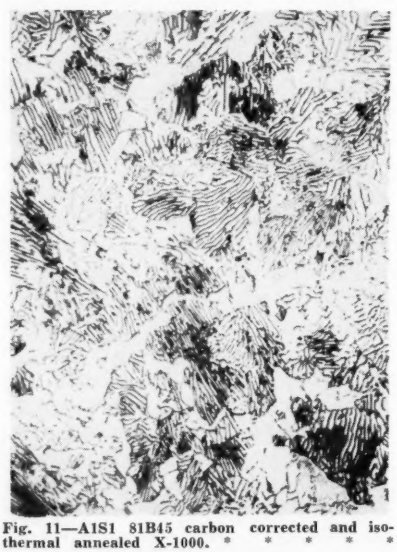

Fig. 11—A1S1 81B45 carbon corrected and isothermal annealed X-1000. * * * * *

A second furnace of this type is now being constructed at our Gary, Indiana plant.

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The continuous roller hearth

furnace was designed for annealing coils as well as bars. The demand for bar annealing was so great however that it was decided to design a furnace specially adapted for the continuous annealing and carbon correction of coil stock. This furnace has now been completed and is in operation at our Massillon, Ohio plant.

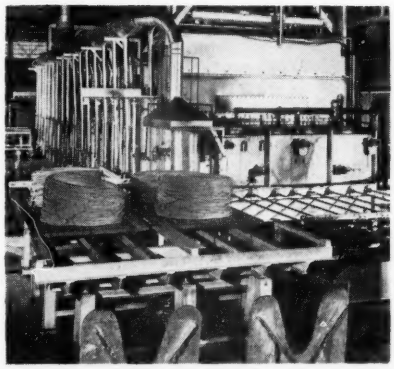

Fig. 12—Carbon correction furnace for coils-general view. * * * * * * * *

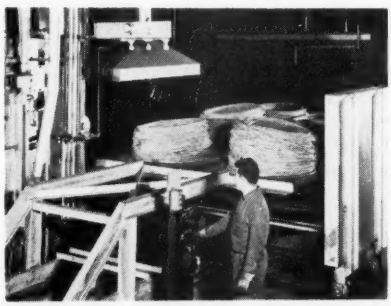

Fig. 13—Carbon correction furnace for coils-discharge end. * * * * * * * *

Figures 12 and 13 show two views of the furnace. It is 86 feet long and has an inside width of 10 feet which permits two rows of coils to move through the furnace on trays. Each tray holds 1500 pounds of work and both rows are pushed simultaneously so that 3000 pounds of work are delivered each time a push is made. There is a vestibule on each end of the furnace large enough to hold two trays. The trays enter or leave the vestibule on a car shown in Figure 14. The cycle is as follows:—

(1) The inner furnace door on the discharge end opens and two trays are pulled into the discharge vestibule and the inner door closes again.

(2) The car moves out of the vestibule, the coils are unloaded, and the car returns to the vestibule.

(3) The inner door on the charge end opens and two trays previously placed in the charge vestibule are pushed into the furnace, and the inner door closes again.

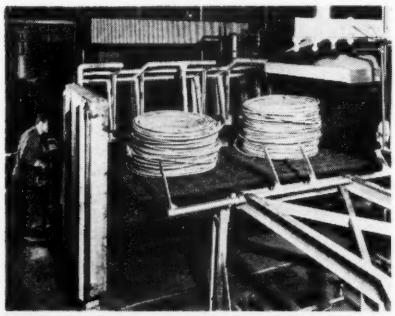

Fig. 14—Coils on trays ready to enter vestibule.

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The prepared atmosphere in this furnace is the same type as is used in gas carburizing (20% CO, 40% H_2, 40% N_2). The furnace is divided into six zones, which makes it very flexible for varying temperature throughout the annealing cycle. The shortest time between pushes is one-half hour, which makes the shortest annealing time six and one-half hours since there are 13 trays in each row of the furnace. Any desired annealing time longer than six and one-half hours can be had by regulating the time between pushes.

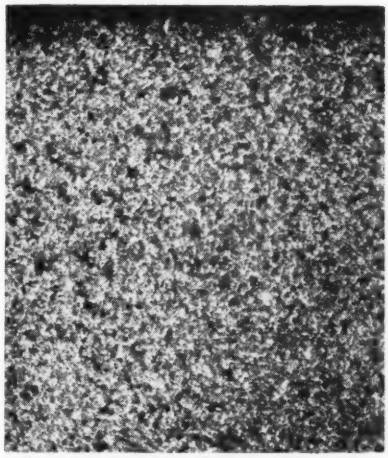

Fig. 15—A1S1 4140 carbon corrected and isothermal annealed in coils X-100. * * * *

Figures 15 and 16 show the structure at 100X and 1000X of isothermal annealed AISI 4140 with carbon correction. This material is used for induction hardened high strength chain pins.

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Figures 17 and 18 show the structure at 100X and 1000X of spheroidized annealed AISI 8740 with carbon correction. This material is used for cold headed aircraft bolts.

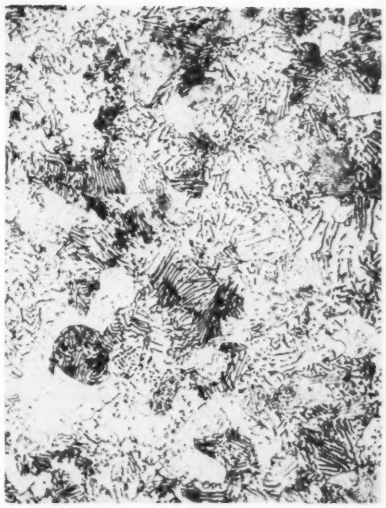

Fig. 16—A1S1 4140 carbon corrected and isothermal annealed in coils X-1000. * * *

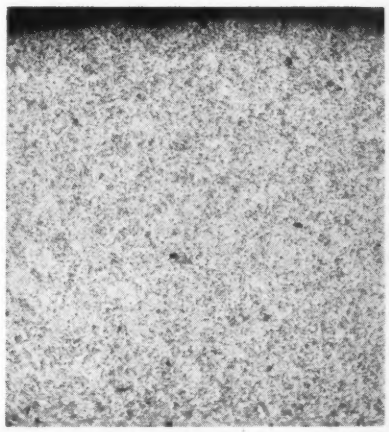

Fig. 17—A1S1 8740 carbon corrected and spheroidize annealed in coils X-100. * * * *

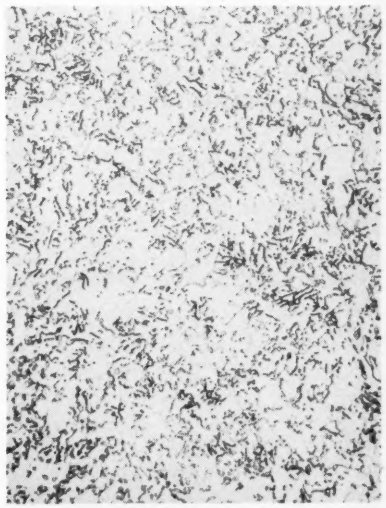

Fig. 18—A1S1 8740 carbon corrected and spheroidize annealed in coils X-1000. * * * *

The development of annealing under atmosphere without decar-

(*Please turn to page* 1359)

How Cold Reduction Affects Several Properties of 18/8 Stainless Steel Wire

by Samuel Storchheim, Engineer in Charge, Atomic Energy Division
Sylvania Electric Products Corporation
Bayside, L. I., New York

Three annealed, non-magnetic stainless steel wires of different analyses were given extensive cold reductions. Magnetic measurements showed that as the wires were being drawn, remanence values increased very rapidly while coercive force values decreased. One of the specimens containing 2 Pct. more Ni than the other two exhibited a marked delay in the appearance of any magnetic constituent when compared to the other two analyses.

It was also observed that tensile strength and specific resistance for two of the specimens investigated increased with increasing percentages of cold reduction. These properties were found to be in part dependent upon the C content of the specimens.

It is generally known that austenitic nickel chrome stainless steels of the 302 and 304 types are paramagnetic in the fully annealed state. However, this condition of low magnetic permeability can usually be changed at room temperature by cold working. Depending upon the chemical composition, the extent of cold deformation and sometimes the heat treatment of the metal, it can be altered partially or almost wholly to a martensitic permanent type ferromagnetic alloy.

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The object of this paper is to present part of the spectrum of magnetic properties; namely, remanence, Br and coercive force, Hc, which are obtained when cold working typical commercial 18/8 stainless steel wires.

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In order to allow for a more comprehensive study of this alloy, ultimate tensile strengths and resistivities were determined for two of the specimens investigated and have been included.

Drawing and Testing Procedures

The effect of increasing percentages of cold reduction on three commercial 18/8 stainless steel wires, the analyses of which are listed in Table I, was investigated. This was accomplished by taking wire at 0.028 in. diam. from each one of the specimens, annealing it at 2150°F (1175°C) in a dissociated ammonia atmosphere and then passing it through a series of progressively smaller diameter diamond dies in a conventional wire drawing unit. The wire was drawn at 250 feet per min. for a few minutes to insure uniformity of rate of reduction and then the drawing machine was quickly stopped. The wire which remained between each pair of dies was removed, labeled and then tested. Nos. 1 and 2 specimens of Table I were given a 92.0 pct. reduction of area. Specimen No. 3, since it contained a comparatively higher nickel content and therefore had a greater inhibition to transform to magnetic martensite, was given a 98.0 pct. red. of area. This was done to transform as much austenite to martensite in the wire as possible.

TABLE I

CHEMICAL ANALYSES OF 302 AND 304 STAINLESS STEELS USED, IN PER CENT

No.	Ni	Cr	Mn	Si	C
1	8.30	18.64	0.55	0.54	0.15
2	8.70	18.49	0.44	0.46	0.19
3	10.67	19.15	1.04	0.51	0.076

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The tests conducted upon the wire specimens included magnetic measurements of remanence and coercive force for all three analyses. Besides this, ultimate tensile strengths and resistivities were determined for the wires of specimens Nos. 1 and 2.

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The magnetic values, Br and Hc, were taken from hysteresis loops which were projected upon a previously calibrated cathode ray oscilloscope screen. The Hysteresis Loop Tester used for these measurements was a specially designed[1] and constructed instrument which was able to accept wires up to a maximum diameter of 1/8". The wire lengths required for testing had to be a minimum of three inches. For fine diameter wires, such as 0.004", several strands of wire, usually six, had to be tested in order to obtain more accurate Br readings.* The accuracy of this instrument was ± 5 pct. for the remanence, and ± 2.5 pct. for coercive force.

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Tensile tests were carried out using a horizontal Scott Tensile Tester, while resistivities were obtained by use of the equation:

$$R = R' \times CM$$

where R' was the resistance per ft. of wire in ohms as obtained on a standard Leeds and Northrup Wheatstone Bridge; CM, the area of the wire in circular mils; and R, the resistivity in

$$\frac{\text{Ohms-CM}}{\text{ft.}}$$

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(1) Numbers in brackets refer to the same number in the bibliography at the end of this article.

* The greater the area of wire that was involved, the more lines of flux were available for measurement, i.e., the hysteresis loop was longer and the Br was measured more readily. The Hc depended on the applied field. Once this was established, the Hc remained constant regardless of the number of wire strands used.

Results

The data obtained for the various percent reduction of the different specimens are tabulated in Tables II to IV. Graphs more clearly revealing the relationships between remanence, coercive force, tensile strength, resistivity and percent reduction of area are presented in Figs. 1 to 4, respectively.

TABLE II, SPECIMEN NO. 1

Pct. Reduction	Hc, oersteds	Br, gausses	Ultimate Tensile, 10^3Psi	Resistivity, Ohm-Cm per ft.
0	0	0	130	430
14	400	20	161	440
26	400	100	187	460
38	280	210	214	450
49	210	510	227	460
59	200	1650	264	420
68	170	3280	250	500
75	160	3920	263	500
82	120	5480	278	500
87	85	6950	344	560
92	80	7670	384	570

TABLE III, SPECIMEN NO. 2

Pct. Reduction	Hc, oersteds	Br, gausses	Ultimate Tensile, 10^3Psi	Resistivity, Ohm-Cm per ft.
0	0	0	132	425
14	400	30	165	440
26	280	280	197	470
38	210	1070	219	455
49	140	2400	232	485
59	135	3480	276	440
68	120	5270	278	515
82	85	6260	292	535
87	75	7300	352	570
92	70	8650	403	585

TABLE IV, SPECIMEN NO. 3

Pct. Reduction	Hc, oersteds	Br, gausses
0	0	0
14	0	0
26	0	0
38	slightly magnetic	
49	440	70
59	400	140
68	400	180
75	340	380
82	340	700
87	340	1120
92	380	1240
95	360	1830
97	360	2640
98	300	3520

A. Remanence vs. Percent Cold Reduction

It can be seen, from Fig. 1 that the remanence increased in a similar parabolic manner for all three specimens as the percent cold reduction was increased. The primary difference among the curves was that they were displaced from each other; i.e., specimen No. 3 of the higher Ni content indicated a delayed initiation in the appearance of any appreciable ferromagnetic constituent; namely, approx. 50 pct. reduction of area as compared to about 15 pct. for both specimens Nos. 1 and 2.

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Specimen No. 2 had a remanence, at 92.0 pct. red. of area, 12.9 pct. larger than that of specimen No. 1 and 597 larger than that of specimen No. 3. The low remanence value for specimen No. 3 as compared to those of Nos. 1 and 2 was again attributed to the higher nickel content of specimen No. 3. The carbon contents did not seem to exert any readily discernible effect.

B. Coercive Force vs. Percent Cold Reduction

With increasing percentages of cold reduction of area, the curves for coercive force for specimens No. 1 and 2 showed a decreasing curvilinear relationship, see Fig. 2. For specimen No. 3, the plotted points, especially for very high reductions of area, were scattered. However, a similar decreasing curvilinear trend was observed for this curve as for those of specimens Nos. 1 and 2. As with the remanence curve, the beginning of measurable coercive force for specimen No. 3 showed a delay in appearance when compared with those of specimens Nos. 1 and 2. Not only was the delay in obtaining measurable values of coercive force obvious, but the Hc values for No. 3 were much greater for all percentages of reduction of area than for those developed by specimens Nos. 1 and 2. At 92.0 pct. red. of area the Hc value for specimen No. 3 was 374 pct. greater than for specimen No. 1 and 440 pct. greater than for No.

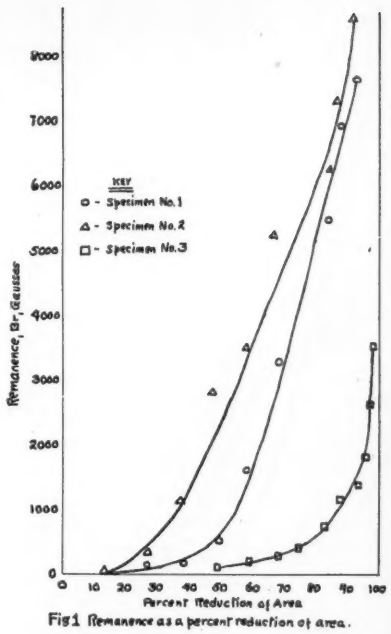


Fig 1 Remanence as a percent reduction of area.

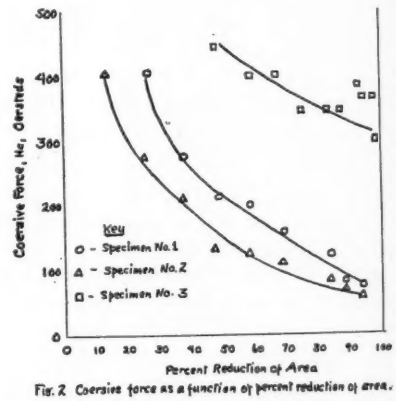
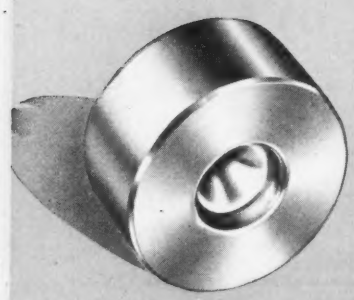
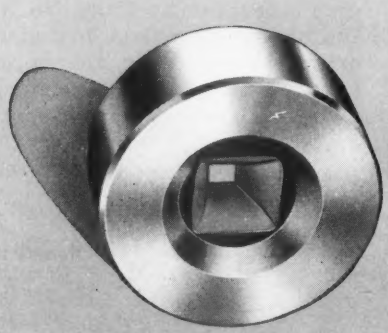


Fig. 2 Coercive force as a function of percent reduction of area.

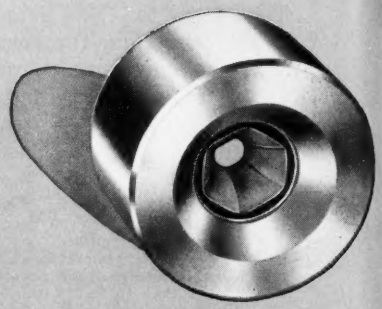
Why it pays to use C



Round-Hole Dies

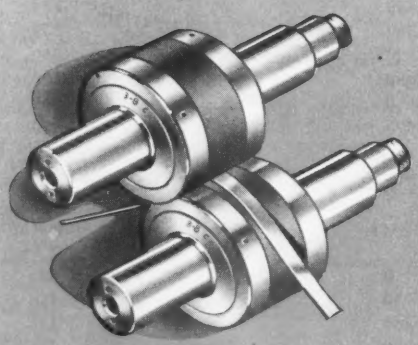


Square-Shape Dies

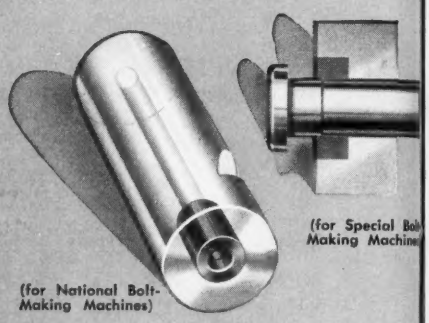


Hex-Shape Dies

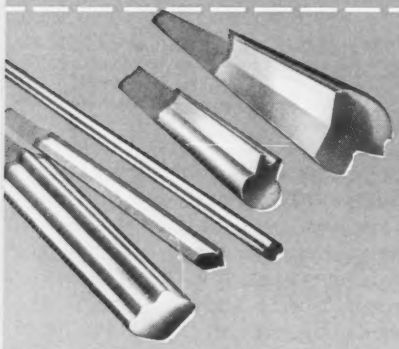
Capstan Rings



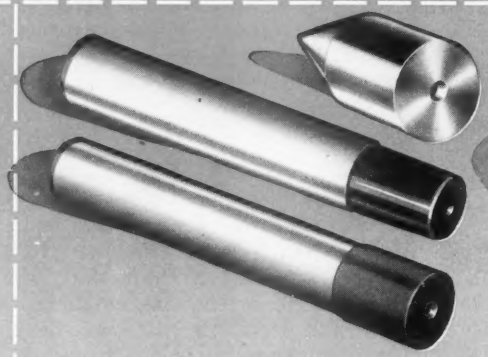
Wire-Flattening Rolls



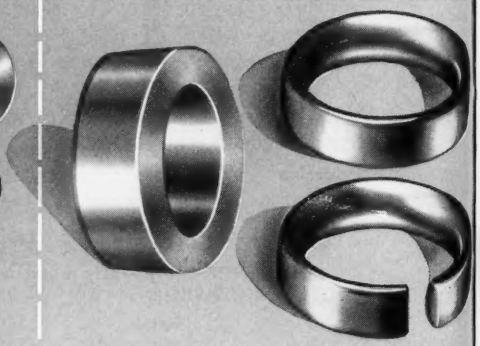
Extrusion Die Nibs



Special-Shape Dies

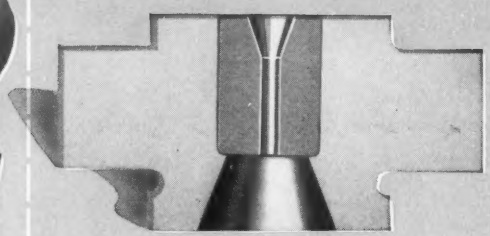


Mandrels and Mandrel Nibs

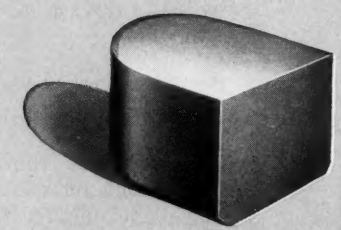


Bushings, Rings and Slotted Wire Guides

ader Die Nibs and Heading Hammers



Welding Rod Coating Dies



Nail Gripper Die Nibs

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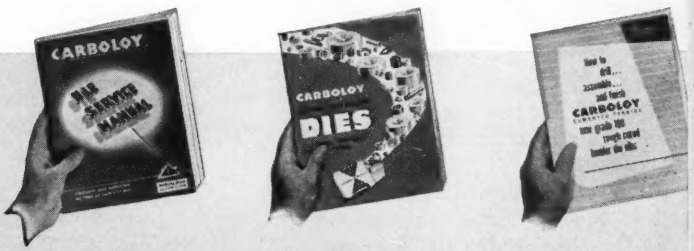

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

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3. The Hc of No. 1 was 14.3 pct. larger than that of specimen No. 2. Once again, it became apparent that the higher nickel content of No. 3 specimen caused the marked difference in Hc values obtained as compared to those of specimens Nos. 1 and 2. The effect of carbon was again not detectable.

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In addition to the above, comparison of the Hc and Br values developed at particular percentages of cold reduction showed, generally, that as the Br increased, the Hc decreased, this with increasing pcts. of cold reduction.

C. Ultimate Tensile Strength vs. Percent Cold Reduction

Fig. 3 shows the relationship obtained between the ultimate tensile strengths and increasing pcts. of cold reduction for specimens Nos. 1 and 2. Both curves were

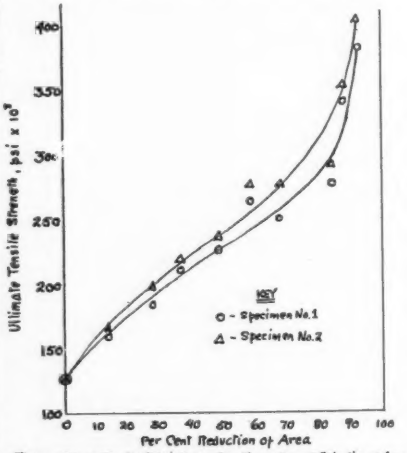

Fig.3 Ultimate Tensile Strength as a Function of Percent Reduction of Area

quite similar in appearance and both indicated a continuous rise in tensile strength with increasing percentages of cold reduction. This correlates with previously published data[2]. The higher carbon content of specimen No. 2 accounted for the upward displacement of its curve from that of specimen No. 1; i.e., for the same percentage of reduction of area the tensile value of specimen No. 2 was greater than that of No. 1.

D. Resistivity vs. Percent Cold Reduction

The points representing resistivity vs. percent cold reduction, see Fig. 4, although showing erratic behavior when plotted still exhibited a general increase of resistivity with increasing percentages of cold work. The curve obtained for specimen No. 2 was displaced upward from the curve representing No. 1. This tended to show that higher carbon contents seemed to cause greater resistivity for wires receiving the same percentage of cold reduction of area.

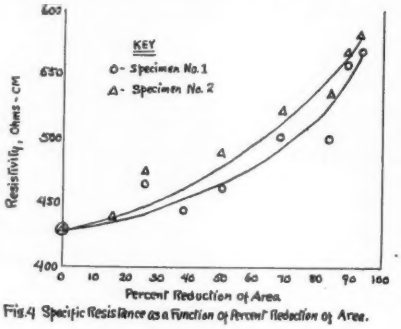

Fig.4 Specific Resistance as a Function of Percent Reduction of Area.

Discussion

Increasing percentages of cold reduction caused the initial austenitic matrix to be progressively transformed to martensite. This change was evidenced by an increase in remanence, tensile strength and resistivity and a decrease in coercive force. The magnetic changes were readily accounted for by the fact that austenite was not ferromagnetic while the martensite was. The rapid increase in tensile strength was likewise accounted for by the fact that martensite has a greater tensile strength than austenite. Since martensite also has a higher resistance to the passage of an electric current than austenite, the increased resistivity with increasing amounts of martensite was also understood.

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In the figures presented, the curves were displaced from each other. This indicated that chemical analysis, the major variable among the specimens drawn, was a definite influencing factor upon the final properties of the wires.

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It seemed that a clearcut appraisal of the effect the various elements had, was difficult to ascertain. This came about because there were only three analyses investigated and these were not tailored for an examination of this type.* It did appear that, in confirmation of general knowledge, a substantial increase in the percentage of Ni, about 2.0 pct., did tend to suppress the austenite to martensite transformation.

Conclusion

It was found that increasing percentages of cold reduction of annealed 302 and 304 stainless steel wires caused considerable magnetic changes to occur. The wires went from an initially non-magnetic state to a ferro-magnetic condition. This was evidenced by increasing remanence and decreasing coercive force values as percent reduction of area increased. A 2.0 pct. increase in Ni composition retarded this change.

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In addition to the above results, it was determined that the tensile strength and the specific resistance of the wire likewise increased as the percent cold reduction increased. Higher carbon contents caused increased tensile strengths and resistivities for the same percent cold reduction.

Acknowledgment

The author wishes to thank the Wilbur B. Driver Co. for its kind permission in allowing the publication of this article.

Bibliography

1. **W. W. Wetzel: "Review of the Present Status of Magnetic Recording Theory. Part I." Audioengineering, November 1947, *31*, No. 10.**
2. **"Metals Handbook," 1948 edition, P. 554, American Society for Metals, Cleveland, Ohio.**

* **To fully comprehend the meaning of chemical analysis, the writer is conducting a series of experiments to determine the effect C, Cr, and Ni have upon the 18/8 stainless steel austenite to martensite transformation. The results of this work will be reported at a later date.**

A New Style De-Scaling Machine

Translated by
Jerome W. Howe, C.E.
Worcester, Mass.

This article, the original of which appeared in the March, 1953, issue of "Draht," concerns a new mechanical descaling machine developed in Germany. In view of the current interest in the subject, it will interest the many steel wire men who are experimenting with dry descaling. In the translation, Mr. Howe has briefed and summarized a rather lengthy treatise.

This anonymous article in DRAHT discusses mechanical descaling. It asserts that for some decades experiments have been in progress by way of improvement of old machines and invention of new ones, but to date the result is still unsatisfactory. Measured by endurance of dies, tonnage of production per hour, or per machine, consumption of lubricant, the results have always been less favorable than by the drawing of pickled rod. Furthermore in the subsequent working and the drawing to finer dimensions some difficulties have appeared:

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The double turn-about of the rod through 180 with small radius of bending led to changes in the metal. Larger rollers which remedied this effected a poorer degree of descaling.

The arrangement of descaling rolls and the bending in of the rod by hand made the introduction of the rod into the machine quite difficult.

The efficiency of the final descaling by wire-brush dropped rather fast due to the wear on the brushes.

The use of steel filings for final cleaning was ineffective after the wire had passed through the filings a short time.

In former tight arrangements of the several elements of the machine or cleaning stations there has been insufficient provision for removal of the scale dust, which settled in successive stations and in the lubricant boxes, leading to operational interruptions and difficulties including lubricant spoilage and excessive wear on the dies.

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Yet the problem of preparing the wire rod for drawing without pickling is one of the most important and pressing, in order to avoid the contamination of water courses with acid waste. If the problem is not solved, many plants will be forced to undertake the building and operation of expensive neutralization works.

Specifications for satisfactory descaling device are the following:

1. Low installation cost.

2. Long life, ensured by slight wear of the individual machine parts.

3. Maximum safety of operation through simple and rugged construction, avoiding complicated parts.

4. Lowered operation cost through avoidance of auxiliary driving mechanism.

5. Complete removal of rolling and annealing scale and the accompanying scale dust from rolled and other wire of all qualities and sizes.

6. The wire must not suffer any change of structure or external mechanical damage that might result in notch effect in subsequent working and diminish the tensile or bending strength.

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It remains to be demonstrated whether the new machine developed in Germany will fulfill in commercial use the foregoing qualifications.

Note: The following item appeared in the Worcester, Mass., Evening Gazette for July 23, 1953:

ACID-DUMPING BILLS ARE FILED

An order seeking to pinpoint responsibility for dumping acid into the sewerage system was filed today with the City Council by Councillor Israel Katz.

At the same time, Councillor George A. Wells filed an order calling for stiffer penalties for any establishment putting injurious matter into the system.

The twin actions followed disclosure by Public Works Commissioner Perry that four "dangerously large and strong" discharges of hydrochloric acid had been detected at the treatment plant in the last two days.

War-time dumping of acids by industries caused the breakdown of the old treatment plant.

Councillor Katz called on Mr. Perry to report to the Council who was responsible for putting acids into the system. He also asked for the Commissioner's recommendations on how to prevent such acts in the future.

Councillor Wells called for a re-examination of the city ordinance against dumping injurious matter into the system.

He suggested a fine of $5,000 or $10,000 might put a stop to the practice.

The present ordinance provides for a $20 fine. But it also permits the Public Works Commissioner to bar use of the sewer system by any establishment found to be dumping injurious matter into the sewers.

Description

The pay-off reel can be fitted with appropriate size interior and exterior diameter rings. The wire is then drawn through the roller-crusher which consists of a system of numerous rolls which cause only slight buckling or deflection of the wire. When the cover is opened, the wire is laid very simply without need for any bending into the breaker. Especially arranged lead rollers prevent any operational trouble in entrance or exit which might result from twisted wire. It does not matter therefore whether the pay-off reel is accurately aligned with the breaker. The rolls are installed with ball-bearings of hard steel impervious to wear and tear by the scale. High pressure application of grease keeps the dust from accumulating in the bearings. A simple hand-operated adjustment sets the machine for greater or less degree of operation according to the size and kind of wire to be descaled. (See Figures 1 to 4)

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The rolls are set at different angles, so that the whole circumference of the wire is contacted at the 16 points, resulting in a complete rough descaling. The wire passes the rolls at an angle of from about 95° to 100° with the axis of the roll. The scale falls out of the drum into laterally attached scale-

catching boxes, from which it is easily removed. The scale amounts to about 1% to 1½% of the weight of the wire.

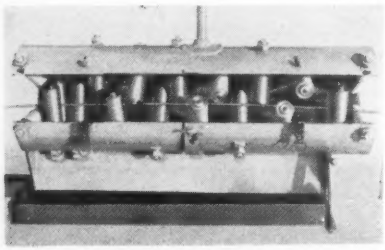

Fig. 1—Roller-crusher opened. * * * *

From the roller-crusher the wire runs through the fine descaling apparatus shown in Fig. 3, in which remaining particles of scale, rust or other adhering particles are removed. The wire runs in a verticle direction through a container filled with steel grit by means of which an intensive cleaning of the wire surface results. The sizing of the steel grit (5 to 10mm.) must be selected for the kind of wire and its strength and size. The fine particles of dust work down through the grit and out through a sieve-like bottom.

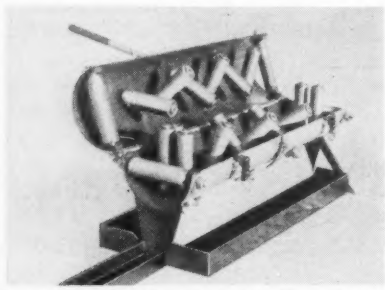

Fig. 2—Roller-crusher with wire inserted. * * *

From the fine descaling apparatus the wire runs through a third cleaning station. This consists of a couple of sheaves of hard-pressed Continental-rubber-nettle material which are driven by the wire running through them. The textile polishing prevents any trace of scale dust being carried over to the dies.

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The wire passes over the grease-box to the die, which is water-cooled in its exit. The die is easily replaced by means of a screw attachment. The grease-box is comparatively long, to permit sufficient duration of passage of the wire through the lubricant. It is of grooved angular form to prevent tunneling of the lubricant. The rear end of the box terminates in square form and includes a deeply indented roller under the entering wire so that the wire is properly directed. Outside of the entrance of the box is a swinging guide roller placed somewhat lower whereby the wire is pressed against the above-mentioned roller thus stopping any rotary movement. This grease-box is appropriate for all kinds of lubricant in liquid, paste or dry condition.

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Comment in the article, which does not divulge the name of the inventor, is to the effect that, contrasted with other known mechanical systems, the passage of the wire is very simple. The case is opened and the wire merely laid between the rollers. A lever closes the case readily. There is no necessity for leading the wire about the rollers. The descaling is complete and free from defect. However, as is the case with all mechanically cleaned wire, a very fine dust still adheres, and can be detected by stroking with a clean finger painted black. The inadequate trial of Argentina machine since early November at Germania Works, where only very limited wire-drawing equipment is available for the trial, has not demonstrated whether this dust is detrimental to successful wire-drawing.

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Heretofore mechanically descaled wire rod has not proved to be so successfully lubricated as pickled rod. DRAHT advises a concerted attack upon the problem of discovery of a lubricant and grease-box that will do as much for a mechanically as a chemically cleaned wire.

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The drawing of mechanically cleaned wire creates production problems and is accompanied with greater bother than the drawing of pickled wire. These disadvantages will perhaps be outweighed by the elimination of pickling acid, together with important provisions for maintenance, operation and transportation, as well as provision for neutralization of the used pickling liquor.

EDITOR'S NOTE: Kenneth Lewis has written: "An interesting and significant fact is that all the makers of lubricating and coating compounds with whom I have lately corresponded have stressed their interest in mechanical descaling of rods and their intention to be ready with appropriate compounds when and if the process shows signs of general adoption."

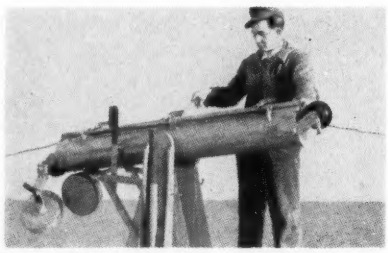

Fig. 3—Fine descaling apparatus with the two polishing rolls. * * * * * * *

The machine's installation requires a space of about 16 ft. x 3 ft. The described installation will clean wire rod up to ⅜" diameter. An installation for larger wire is under construction. The trials reported seem to indicate that lubricant to an amount of from 0.8 to 1 pound per ton of wire is required. At an inspection by many wire industry people wire rod 5.3 mm. size was by six drafts drawn to 1.97 mm. and the cleaning installation was judged to be effective.

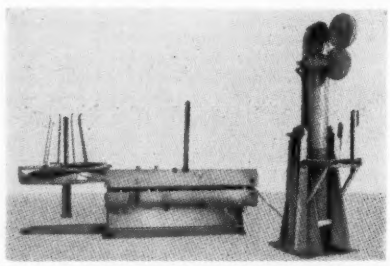

Fig. 4—Pay-off reel, roller-crusher and fine descaling apparatus in working position. * *

Summed up, it can be affirmed that a further simple but adequate service test of the descaling of wire rod by the installation "Argentina" is required, so that the installation cost of such a process can be compared with that of pickling. The next important problem remains to furnish a lubricant that will make drawing and subsequent working as satisfactory for mechanically cleaned as for pickled wire rod.

Government Wire Production Information

Rehabilitation and Reconstruction in Korea

As requested by the President, the Congress has authorized up to $200 million to be made available out of funds appropriated for the Department of Defense, for the expanded United States program of rehabilitation and reconstruction in Korea. The Honorable C. Tyler Wood (formerly Deputy to the Director of the Foreign Operations Administration), as U. N. C. Economic Coordinator in Korea on the staff of General John E. Hull, Commander-in-Chief, United Nations Command, is administering this new phase of the United States program, and is responsible for its coordination with other U. S. programs in Korea, as well as the program of the United Nations Korean Reconstruction Agency (UNKRA).

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Authorizations for purchases of commodities and services for the new phase of the U. S. program in Korea will be issued by FOA. Exactly how procurement will be done has not, as yet, been definitely decided and will not be until Mr. Wood has completed further negotiations there. Wherever practicable, normal commercial channels will be used. However, during the early emergency phases of the program, it is probable that U. S. Government procurement agencies will be utilized. Cotton, and perhaps other commodities, will be handled by the Korean Purchasing Commission.

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In accordance with Section 538 of the Mutual Security Act of 1951, as amended, the Office of Small Business will publicize to firms on its regular mailing list information on procurement, following the same procedure that has been employed in the past with respect to procurement financed by MSA and TCA.

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The Office of Small Business has also arranged with UNKRA (United Nations Korean Reconstruction Agency), which is administering a program of rehabilitation and reconstruction in Korea, that details of UNKRA-financed procurement that will be handled by the General Services Administration, Department of Defense, Department of Agriculture, etc., will be publicized by the Office of Small Business in the same manner as purchases for Korea that are financed by the FOA.

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Requests for information concerning Korean procurement under both of these programs should be addressed to the Office of Small Business, Foreign Operations Ad-

MICROMETER PRECISION — MICRO-WELD — TRADE MARK REGISTERED

MODEL M-T, FOR BENCH MOUNTING

This welder was designed and developed expressly for welding all types of fine wire: Aluminum, Copper, Brass, Bronze, Steel and Steel Alloys, ranging in size from .005" to .020" diameter.

Unit design of frame, transformer and power sub-assemblies permit other range of sizes to suit requirements.

Equipped with a temperature indicating annealing and tempering device, voltage regulator and meter to compensate for voltage fluctuation, wire cutters, extra large 5" diameter magnifying glass, fluorescent light and extension cord. Welder can be supplied for bench mounting, or mounted on 4-wheel truck.

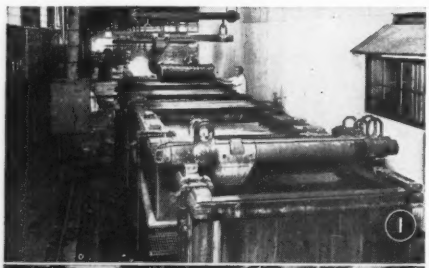
The adaptability of this unit for welding all types of wire, either ferrous or non-ferrous, in sizes from .005" to .020" diameter, makes it ideal for the fine wire manufacturer.

MICRO PRODUCTS CO.,

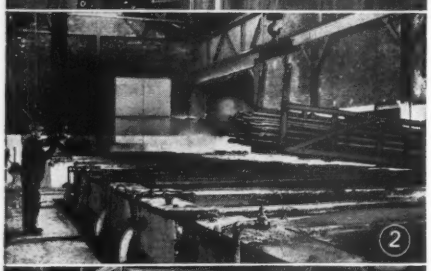
20 NO. WACKER DR., CHICAGO 6, ILL.
Telephone: STATE 2-7468

AMERICAN CHEMICAL PAINT COMPANY
AMBLER CHEMICALS ACP PROCESSES PENNA.

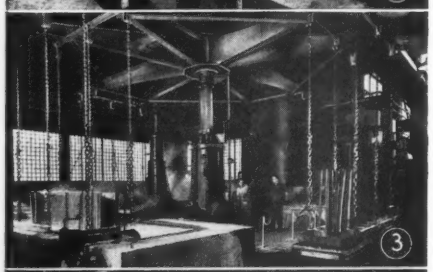
Technical Service Data Sheet
Subject: EFFICIENT PICKLING
WITH RODINE®



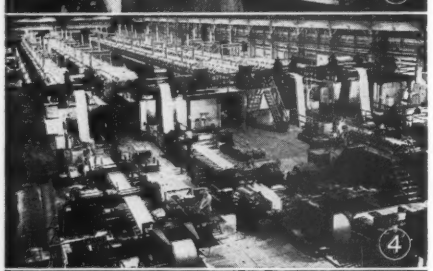
1. Rod and wire are pickled clean with "Rodine" without wasting either acid or metal. Breakage in drawing due to acid brittleness is minimized.



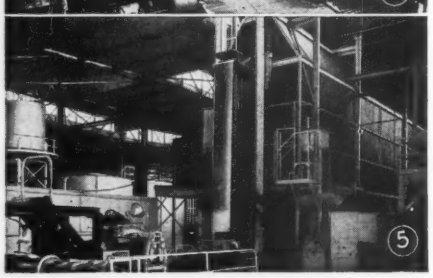
2. "Rodine" protects the exterior of tubes while completely descaling the interior and minimizes breakage in drawing due to acid brittleness.



3. "Rodine" makes possible the batch pickling of sheets over a wide range of acid concentration and temperature.



4. Whether sheet steel is pickled continuously or in batches, "Rodine" improves the surface and prevents "pickle burning" in prolonged pickling.



5. The absence of pitting and the smoother surface obtained with "Rodine" saves expensive coating metal in electrolytic tinning and galvanizing.

CHEMICALS ACP PROCESSES

WRITE FOR DESCRIPTIVE FOLDER ON "RODINE" AND INFORMATION ON YOUR OWN PICKLING PROBLEM.

CHEMICALS ACP PROCESSES

ministration, Washington 25, D. C., but until procurement is actually undertaken, the foregoing is all of the information available.

★ ★ ★

The Embassy of the Republic of Korea also occasionally buys certain products for the Government of Korea, and has agreed that, wherever feasible, they will inform the Office of Small Business of such proposed purchases for publication in the Small Business Circulars.

★ ★ ★

This Memo revises and supersedes the Memo (FOA/SBM No. 53-4) of August 14, 1953, on the same subject.

New Spring Dynamometer Announced

The George Scherr Company announces a new Precision Dynamometer for measuring spring tension, starting torque and the force required to actuate delicate mechanisms.

★ ★ ★

The instrument is a highly valuable aid to the inspector or engineer in determining and checking the pressure required to overcome spring tension and other kinds of resistance in fine precision mechanisms such as electric contacts, relays, telephones, clocks, business machines, micro-motors for electric razors, windshield wipers, time switches and other products.

★ ★ ★

Applications can be found in almost every field of industry where uniformity of pressure, starting torque or spring tension are necessary to insure proper functioning.

★ ★ ★

The instrument is available in two models, small and large, each in several ranges in grams of pressure, acting in both directions. Small number in ranges 5-15, 5-30, 10-50, 20-100, 25-150 grams. Large model 25-250, 50-100, 100-1000 grams. The price of the small model in all ranges is $9.85 each, the large models are $33.75 each. Illustrated pamphlet showing applications in various industries can be obtained from the George Scherr Company, 200 Lafayette Street, New York 12, N. Y.

ABSTRACTS

SOME OBSERVATIONS ON THE WORK-HARDENING OF METALS; FUNDAMENTAL STUDIES RELATED TO THE ORIGIN AND NATURE OF CREEP OF METALS.

E. H. Edwards, J. Washburn, E. R. Parker. Calif Univ Inst Engg Res 1953 (NP-4554: Techn Rep 8) 22 pp (Apr); Nuclear Sci Abstr 1953 Vol 7 (13) pp 460-461 (July 15).

METALLIC WIRE NETS FOR SIEVES. V. Turati. Ceramica 1953 Vol 8 (1) pp 49-55; abstr Am Ceram Soc Journ 1953 Vol 36 (8) p 144 (Aug) (Original in Italian).
Italian standard meshes with metric dimensions and tolerances. Comparisons with US standards.

DRAWING FINE ALUMINIUM WIRE. W. H. A. Robertson & Co Ltd, Bedford. Wire Ind 1953 Vol 20 (236) p 771 (Aug).
Type 17 FWJ machine for drawing wire down to 0.005 in. has max die complement of 17, self-contained with lubricant circulating system, precision spooler, etc. Normal operating speed is 4,000 ft/min. typical runs from 0.044 in. inlet to 0.0124 in. 10% mixture Duckham's Q.5032 soluble oil and water recommended for fine sizes, mineral oil for sizes above 0.010 in. Sizes down to 0.0028 in. may be produced at high speeds on commercial basis. 1 illustr.

METHODS OF WIRE PRODUCTION. K. V. Aiyer. Indian Inst Met Trans 1951 Vol 5 pp 95-110; abstr Iron & Steel Inst Journ 1953 Vol 174 (4) p 404 (Aug).

Note: These abstracts are published through the courtesy of the Industrial Diamond Information Bureau, 32 Holborn Viaduct, London, E.C. 1, England. Please direct inquiries regarding them to the Bureau.

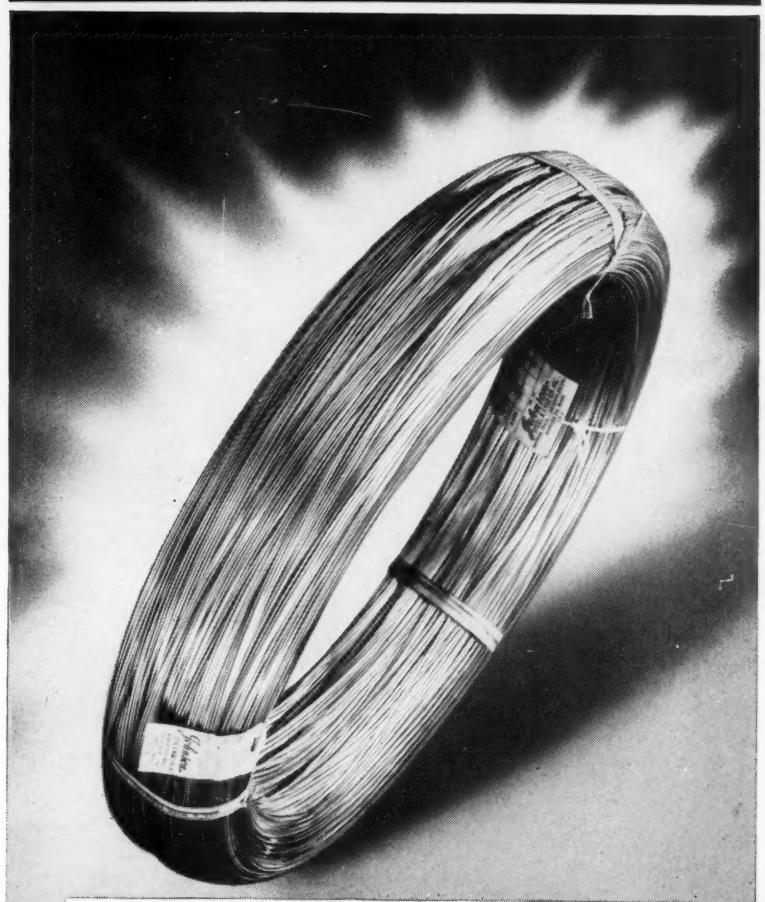
Aluminum Insect Screen Wire

More than 266 billion feet of Alcoa Alclad Aluminum wire—enough to reach to the moon and back 100 times—have been woven into insect wire screening. This was announced by **David B. Miller,** Manager of Wire Sales for **Aluminum Company of America.** This figure represents nearly 700 million square feet of screening—enough to protect more than 55 million average size residential windows.

★ ★ ★

The acceptance of aluminum insect screening has increased dramatically over the last few years, since its first appearance on the consumer market. Today, it is specified for many original installations and is becoming a top choice for replacement.

★ ★ ★



High Quality High Carbon Wires

Some things cannot be measured. We don't think of a ton of truth, a bushel of beauty or an aspiration a mile long.

But we can measure wire to a degree close to absolute perfection. And that is your safeguard that every Johnson wire is true to gauge—and made exactly in accordance with specifications best for your purposes. That's why a specialty mill is best for the production of specialty wires. Johnson's was never a tonnage plant—but rather a closely knit business for the making of these wires all the way from steel rod to finished product—always under absolute laboratory control.

JOHNSON

JOHNSON STEEL AND WIRE COMPANY, INC.

WORCESTER 1, MASS.

New York Philadelphia Cleveland Detroit Akron Chicago
Atlanta Houston Tulsa Los Angeles Toronto

A SUBSIDIARY OF PITTSBURGH STEEL COMPANY

THE DOLLARS YOU SPEND ON REELS GET THE MOST WHEN YOU BUY NARCO METAL BOUND REELS

Narco Metal Bound reels last three to four times as long as all wood reels. A 36" Narco Metal Bound reel will make four trips for every one trip obtained from a 36" all wood reel. Narco Metal Bound reels require no repairs. The initial cost is the only cost of the reel. Substitution of 36" Narco Metal Bound reels for 36" all wood reels reduced the cost per trip of this diameter reel for one company from $2.91 to $.80.

Further information or quotation furnished on request.

North Anson Reel Co.

NORTH ANSON, MAINE TELEPHONES: MADISON 6-3171 6-4471 6-3367

The advantages of insect wire screening of aluminum are the best explanation for the growth in its use. Aluminum prevents objectionable staining of light walls and sills. It is a strong, long-lasting material, with corrosion-resistant properties to make it outlast inferior screening materials. It will not rot, and is unaffected by normal changes of temperature in any area.

★ ★ ★

Color is another important factor in the choice of screening material. The modern light color of aluminum makes it blend with any type exterior, and is adaptable to any decorative scheme.

★ ★ ★

Insect wire screening of Alclad Aluminum is recommended since it is the only Aluminum screen wire which meets Federal Specifications and Department of Commerce standardization requirements. Also, screens woven of Alcoa Alclad Aluminum are subject to certification by the Insect Wire Screening Bureau as meeting the standardization requirements of the National Bureau of Standards.

Circular Describes New Toolholder

The Metal Carbides Corporation, Youngstown, Ohio, announces the publication of a new four-page circular, No. KL-53, which describes the new style Klamp-Lok Toolholder recently developed and ready for distribution. This new, improved toolholder utilizes standard carbide blanks and mechanically clamps same to the toolholder in a horizontal position.

★ ★ ★

The Klamp-Lok H-Style Tool is available in 3 standard styles and 36 standard sizes. Standard Talide blanks are available in 7 standard sizes, 14 standard styles and in 4 standard grades.

★ ★ ★

The above tool is finding widespread application throughout industry, particularly on heavy-duty turning operations on lathes, boring mills and planers.

New Rod Mill for AS&W's Cuyahoga Works

A major step in modernizing and expanding its production facilities in Cleveland has been taken by American Steel and Wire Division.

★ ★ ★

A new rod mill, substantially increasing the plant's rod production as well as replacing older equipment, will be constructed on properties of the present Cuyahoga Works. The new facilities, which will include a combination rod mill, billet storage areas, and rod storage areas, will have a rated capacity of 450,000 tons per year compared to the present equipment's annual rated capacity of 313,000 tons.

★ ★ ★

"Expansion of these facilities is only natural because of the great concentration in Cleveland and Detroit of industries which are using ever greater quantities of rod, wire and wire products," Walter F. Munford, President of the Division, stated. "One of the major considerations given to the construction of this mill at this time is the important role it will play in helping serve the nation as a tool for national defense."

★ ★ ★

Billets for the new mill will be supplied principally from National Tube Division's Lorain, O., Works.

Chemical Resists Oxidation of Copper

Passivation of copper and most copper alloys is now available in a simple chemical dip and rinse process.

★ ★ ★

Standard bright dips such as nitric and sulfuric and various chromate dips, remove oxides quickly but reoxidation begins minutes after the original immersion.

★ ★ ★

ROSSAUL COPPER-BRITE removes atmospheric oxides in "seconds to minutes" and simultaneously PASSIVATES the metal so that it will resist oxidation WITHOUT SURFACE COATING — for periods ranging from three to six

KEYSTONE
"Special Processed"
COLD HEADING WIRE

EXCELLENT FLOW PROPERTIES
PROLONGS DIE LIFE
FEWER REJECTIONS
REDUCES INSPECTIONS

You gain increased efficiency from your cold heading machines when you specify KEYSTONE "Special Processed" Cold Heading Wire. The excellent flow properties of this "Special Processed" wire assures uniform, strength-giving grain structure which "trademarks" high quality production.

Rigid quality controls and careful selection of raw materials — plus our own exclusive drawing and heat treating process gives KEYSTONE "Special Processed" Cold Heading Wire unsurpassed structural soundness and uniformity for all your difficult cold heading operations. For further information, write Keystone Steel & Wire Company, Peoria 7, Illinois.

Keystone Steel & Wire Company
PEORIA 7, ILLINOIS

3 ways *Solar* solves a sales problem... IN YOUR FAVOR

...with SOLDURA GRAY WIRE COLOR SOLUTION

1 GREATER SALES APPEAL!

Gray Soldura gives the buyer visible evidence that the flame-proof compound on non-metallic sheathed cable and service entrance cable is completely sealed and covered. Moreover, it camouflages service entrance cable used on white houses and forms an excellent base for the subsequent application of house paint.

2 STAYS CLEANER!

Gray Soldura *looks* cleaner because it *is* cleaner. It's used with a clear wax top dressing (which makes it easier to pull through joists or fish through conduits) and will not mark up walls during installation. Workmen's hands stay cleaner, too.

3 PROTECTS against STICKING!

Actual laboratory tests have shown that gray Soldura, applied with a proper saturant and finish, will prevent sticking at temperatures as high as 140°F. and will not flake off under freezing conditions.

FOR GREATER SALES APPEAL... FOR CLEANER APPEARANCE, EASIER HANDLING, AND FREEDOM FROM STICKING OR FLAKING... USE SOLDURA... THE GRAY WIRE COLOR SOLUTION THAT BUILDS SALES.

SPECIFICATIONS*

Weight per gallon	15-16 lbs.
Total solids	75-80%
Viscosity, Gardner Mobilometer @ 77°F., 250 grams load	15-20 seconds
Estimated coverage—Sq. Ft. per gal.	1250-1500
Number of coats recommended	Two, for best results
Colors	Light, medium and dark gray

**Gray Soldura is soluble in alcohol, acetone, and common lacquer solvents, but is not soluble in gasoline and petroleum solvents.*

FOR SPECIFIC INFORMATION ABOUT GRAY SOLDURA MS-551 AND A COMPLETE REPORT ON OUR LABORATORY TEMPERATURE TESTS, WRITE TO SOLAR COMPOUNDS CORPORATION.

Solar Compounds Corporation
Solar Varnish Corporation
The Originator of Wire Color Solutions
1213 WEST BLANCKE STREET • LINDEN, N. J.

months, dependant on atmospheric conditions.

★ ★ ★

ROSSAUL COPPER-BRITE is completely safe to handle, special drains not required, non-toxic, non-fuming, requires no special ventilation, will not discolor silver solder and will not etch.

★ ★ ★

Inquiries should be referred to: Rossaul Co., 170 Fifth Ave., New York 10, N. Y.

Pickling Compounds Described In Catalog

The Mitchell-Bradford Chemical Company, 2446 Main Street, Stratford, Conn., has developed two compounds for scale and rust removal.

★ ★ ★

"Pik-Aide" added to acid pickles, is said to reduce acid action on bare metals to a minimum, reduce acid consumption, make possible thorough rinsing, remove soils on the stock, and to be non-toxic and non-inflammable.

★ ★ ★

"Quick Pik" is a dry acidic salt, which when added to water, will remove rust and scale. It incorporates an inhibitor and a foaming agent to minimize acid attack on the metal and reduce fumes to a minimum.

★ ★ ★

The catalog also contains information on chemicals producing a black-oxide finish on iron, steel and stainless steel, for cleaning prior to plating, for rendering water a cleaning, rust inhibiting solution and on a complete line of heat treating salts.

★ ★ ★

Copies may be had upon request.

Synthetic Insulating Material Notes

Dacron, the polyester fiber which has caused quite a commotion in the textile field, is now being used for electrical insulation. In addition to its chemical resistance and low moisture pickup, it offers strength and heat resistance. It can be made tougher than asbestos

and is readily applied as an insulating cover.

★ ★ ★

Wire insulated with silicone rubber has been approved by the Underwriters' Laboratories for use in devices and appliances operating at temperatures up to 390 F. The flexible silicone coating, ranging in thickness from 15 to 77 mils, is covered with a lacquered glass fiber braid having high abrasion resistance. The silicones are still too high in cost for ordinary applications. But it looks as though the favorable insulating properties of synthetic coatings will shortly edge natural rubber out of wire and cable insulation entirely, barring an unexpected drop in the price of natural rubber.

★ ★ ★

Manufacturers of small wires, such as telephone cables, are finding them especially advantageous and are reporting a useful life of over 15 million feet of wire, in addition to other advantages, as compared with approximately 50,000 feet of wire production that can be secured from the conventional tool steel nozzle.

★ ★ ★

Stocks of these nozzles are carried, but they can also be made to customers' specifications and a large stock of carbide bushings is maintained with I.D.'s varying from .015″ to .125″.

New Economy for Diamond Powder Users

A new Diamond Compound has been developed by the Diamond Dust Company that is 1.7 times, by actual test, as economical as diamond powder.

★ ★ ★

Plants employing lapping and polishing operations on: carbide, sapphire, steel and other hard materials, as well as those concerns that perform precision grinding, and plastic mold polishing, can all take immediate advantage of this increased economy.

★ ★ ★

Industrial plants will find by us-

RELIEF FROM REEL HEADACHES

Rx

Our Prescription

NARCO METAL BOUND REELS

TRIPLE REEL LIFE—A Metal Bound Reel will exceed the life of a comparable all wood reel three to four times.

ELIMINATE REEL REPAIRS—No repairs are made to Metal Bound flanges.

LOWER REEL COSTS—Longer reel life and elimination of expensive repairs will drive your reel costs down.

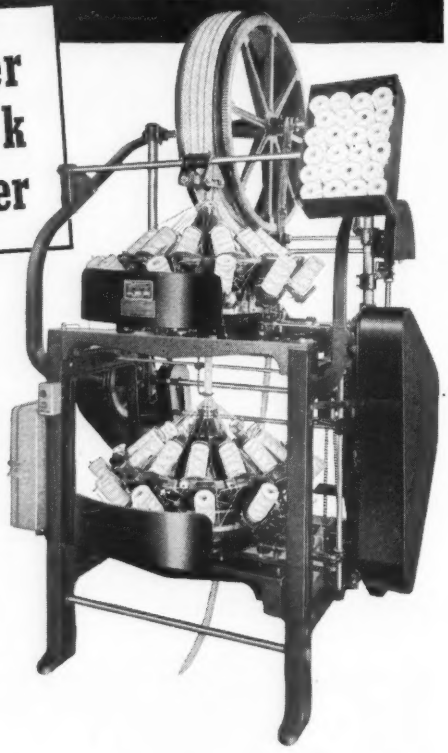
We will be pleased to furnish further information or quotations on request.

North Anson Reel Co.

NORTH ANSON, MAINE TELEPHONES: MADISON 6-3171 6-4471 6-2347

THE NEW "WARDWELLIAN"®

24-24 Carrier Double Deck Cable Braider



This machine has all the features of the WARDWELLIAN Cable Braider, plus the added feature of applying two layers of braid simultaneously. Each head can be adjusted individually to give the desired number of picks or plaits for each layer of braid.

Machine is driven by a three horsepower adjustable speed motor that gives great flexibility of operation through the dial control. Power is transmitted from motor to braider through the medium of a Maxitorq Floating Disc Clutch mounted on the countershaft.

- Production 44″ to 340″ per minute depending upon the texture of the product.
- Standard set of eighteen change gears for varying takeup furnished with each machine.
- Standard set of ten change gears for varying speed of lower head furnished with each machine.
- Carrier speed 75 R.P.M. for cables ¾″ diameter to the maximum of 1⅛″ diameter or 500,000 circular mils; production 900 picks or plaits per minute.
- Carrier speed 100 R.P.M. for cables ¾″ diameter and under, 1200 picks or plaits per minute.
- Speed of braider countershaft 345 R.P.M. for carrier speed of 75 R.P.M. or 460 R.P.M. of countershaft for carrier speed of 100 R.P.M.
- Ratio braider countershaft speed to carrier speed 4.6 to 1.
- Carrier speeds can be varied from a maximum of 100 R.P.M. to a minimum of 33 R.P.M.
- Capstan 36″ diameter, 6″ face.
- Beater openings in both upper and lower heads 1¾″ diameter.
- Supply yarn packages Universal wound, 2 1/16″ dia., 5″ traverse, on tube 5¼″ long, ⅝″ hole, four point wind.
- Supply and windup stands not furnished.
- Machine can be adapted for producing one-and-one braid by changing thread deflectors.
- Counter for measuring in feet or yards furnished upon request.
- Weight approximately 2500 lbs.

REPRESENTATIVES
FOR EUROPE, BRITISH COLONIES
AND DEPENDENCIES
JAMES MACKIE & SONS, LTD.
BELFAST, IRELAND

Wardwell
BRAIDING MACHINE CO.
CENTRAL FALLS, RHODE ISLAND, U.S.A.

ing Diamond Compound that their work will be cleared thoroughly by application of water for occasional inspection during and at completion of their lapping, polishing or cutting operations. They will find, too, that by using Diamond Compound that the salvage of the used diamond powder is greatly simplified. On dissolution of the paste with water, the diamond powder, along with the abraded metallic particles, can easily be collected and the valuable diamond powder salvaged.

★ ★ ★

The new diamond compound, called DIA-DUSCO, has these real advantages: it is fully soluble in water, will not dry out, roll up, or become unworkable even after long periods of use, gives good adhesion, provides excellent dispersion for the abrasive, each grade is colored distinctively and for ease of identification the colors follow the visual spectrum from violet to red.

★ ★ ★

Industrial plants desiring further data and a specially prepared DIA-DUSCO compound folder, should contact the Diamond Dust Co., 15 West 44th St., New York 36, N. Y.

Flange Straightening Press for Metal Spools and Reels

Leading wire manufacturers find that metal spools and reels up to 36 inches diameter and 24 inches traverse, with flanges ½ inch thick, are quickly and accurately straightened by the **Ross & Company** Flange Straightening Press. An adaptation of this company's versatile 20 ton production press, salient features of the new Flange Straightening Press are: all steel welded construction, heat treated to relieve stresses; double acting Meehanite (R) cylinder with hard chrome plated ram; 60 inches per minute travel under full load with retracting speed 90 inches per minute; 12 inch stroke—16 inches daylight under retracted ram; vane type pump operating at 1250 PSI.

★ ★ ★

The entire unit is self-contained and occupies 28 by 34 inches floor space and is powered by a 5 horsepower 220/440 volt 3 PH motor.

Substitution of the regular platen for that cut out to accommodate reels immediately converts the press for the uses described in an illustrated bulletin available from the manufacturer, Ross & Company, 1401 East 57th Street, Chicago 37, Illinois.

Primary Wire for Fleets in All Standard Colors Announced by Auto-Lite

Production of a complete line of primary wire designed especially to meet specifications of the trucking industry has been announced by **The Electric Auto-Lite Company.**

★ ★ ★

Auto-Lite primary wire now comes in all standard colors (green, white, blue, black, brown, yellow and red) in each gauge, the company announced. In addition, the fabric-covered, loom-braided wire has extra coats of lacquer for more abrasion resistance and durability and has a high-luster finish.

ASA Offers Booklet

"Standards Are Your Business," a 24-page booklet defining standards of production and their value as tools of management, appears in a new, revised edition just issued by the **American Standards Association** to emphasize the economic importance of standardization.

★ ★ ★

The booklet gives the philosophy and objectives of the voluntary standards movement in this country and contains considerable new material, including a section on Federal Government policy toward industry standards. Included are specific examples of recent savings through standardization effected by leading U. S. corporations which are named.

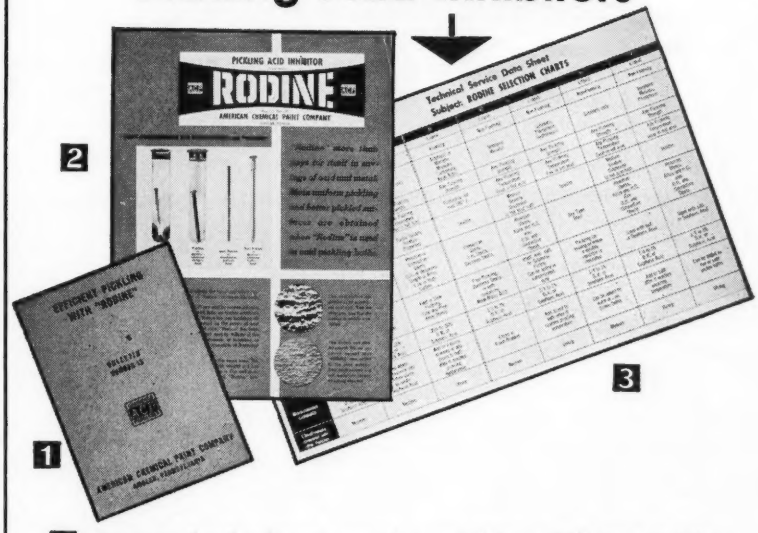
★ ★ ★

Copies are available without charge from the American Standards Association, 70 East Forty-fifth Street, New York 17, N. Y.

New Data Available on . . .

RODINE®

Pickling Acid Inhibitors



1 The standard reference work on pickling, "Efficient Pickling With RODINE" — Bulletin Number 13 — is now available in a new, revised edition.

2 This new 4-page general descriptive folder presents essential information on "Rodine" pickling acid inhibitors.

3 The recently revised "RODINE SELECTION CHART" gives characteristics of and uses for typical "Rodines" used with sulfuric and muriatic acids. Technical Service Data Sheet No. 13-1-1-4.

Use coupon below for free copies of the literature described above.

AMERICAN CHEMICAL PAINT COMPANY

***General Offices:* Ambler, Penna.**

Niles, Calif. Detroit, Mich. Windsor, Ont.

CHEMICALS ACP PROCESSES

CLIP AND MAIL TODAY!

American Chemical Paint Co.
Ambler, Pennsylvania

Gentlemen:

Please send me FREE:

- ☐ "Efficient Pickling With RODINE" — Bulletin No. 13.
- ☐ 4-page general descriptive folder.
- ☐ "RODINE SELECTION CHART"

Name .....

Company Name .....

Address .....

City ..... State .....

Outstanding Personalities of the Wire Industry

Sheet and Tube Advances Tierney

J. Paul Tierney, former metallurgist in the **Youngstown Sheet and Tube Company's** Rod, Wire and Conduit plant and Merchant Mills at Struthers, has been appointed assistant superintendent of the company's Rod, Wire and Conduit plant. He succeeds John D. Anderson who died recently.

★ ★ ★

Mr. Tierney, a native of Youngstown, early joined The Youngstown Sheet and Tube Company and worked in the Seamless Tube Mills at Campbell and in the Brier Hill Sheet Mills. He left to go with Republic Iron and Steel.

★ ★ ★

In 1934 he returned to The Youngstown Sheet and Tube Company as assistant tester in the Rod and Wire Metallurgical Department. About a year later he became a tester; in 1936 was named laboratory foreman; served as assistant metallurgist from 1940 to 1944 then metallurgist in the Rod, Wire and Conduit plant and Merchant Mills until his recent promotion.

★ ★ ★

He is a member of the American Iron and Steel Institute, The Wire Association and the Society of Automotive Engineers.

Cornish Wire Expands

The Cornish Wire Company has shifted a part of its wiremaking production to North Adams to free plant space in its Williamstown plant for other expansion.

★ ★ ★

The new plant, located in the Blackinton section of North Adams, will be operated under the name: "Cornish-Blackinton Co." Its manager is **David Hawk,** who comes to the Cornish organization from the B. F. Goodrich Chemical Co.

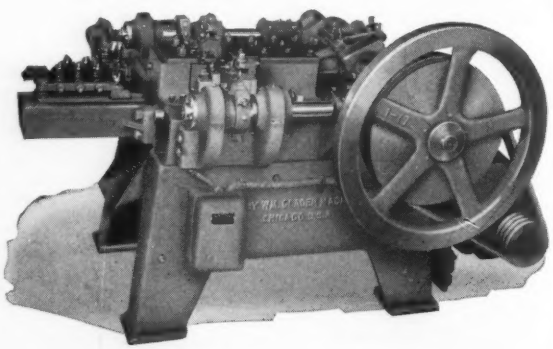
★ ★ ★

The Company will specialize in the manufacture of electric wire and cable insulated with vinyl plastics. As it is situated only two miles from the major plant in Williamstown, the problems of interplant transfers are simple.

To Head Sales for Republic's Union Drawn Division

Eugene B. Files has been appointed manager of sales for **Union Drawn Division,** Massillon, Ohio, Republic Steel Corp. He succeeds the late **Fred C. Young.** Mr. Files assumes this position after 33 years with Republic and predecessor companies. Since 1930 he has been with Republic's Detroit sales office, in recent years serving as assistant district sales manager.

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

Celanese Announces Appointments

Bruce B. Allen, Manager of the Summit Research Laboratories of **Celanese Corporation of America,** has announced the following appointments: **Raymond A. Gobeil** as head of the physical testing laboratory; **Joseph A. Berg,** as head of personnel administration; and **Harold K. Haviland** as associate head of the technical information section.

★ ★ ★

At the same time it was announced that **Frank W. Turner** has been named Sales Service Engineer of the Marco Products Department of the Plastics Division of Celanese for the purpose of developing applications of reinforced polyesters in the building of tanks, pipes and other equipment in the chemical, oil and transportation industries.

Named Vice President of Copperweld

Paul Van Wagner has been appointed vice president of **Copperweld Steel Company,** Pittsburgh, Pa., it was announced by **Frank R. S. Kaplan,** president. In his new capacity, Mr. Van Wagner will be on Copperweld's corporate staff, with headquarters in the company's executive offices, Frick Building, Pittsburgh.

★ ★ ★

He formerly was vice president in charge of sales of the wire and cable division at Glassport, Pa., and president of the Copperweld Steel International Company. He will continue in the latter post in addition to his new duties.

★ ★ ★

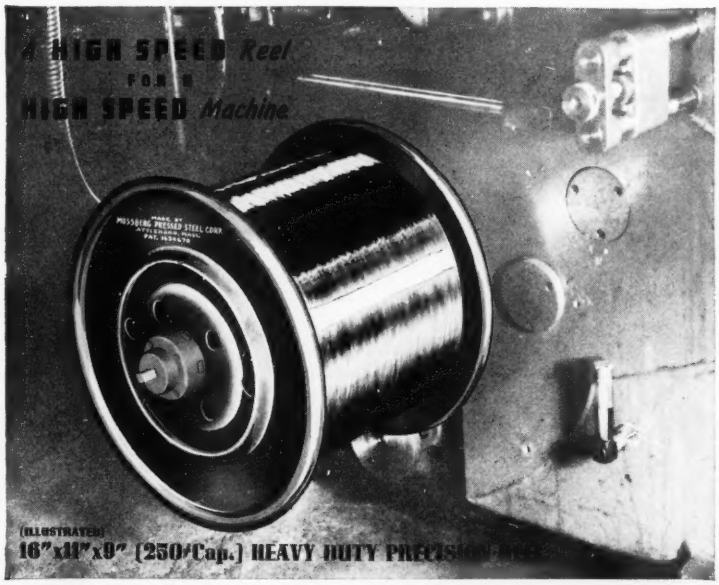
For more than 25 years, Mr. Van Wagner has been associated with Copperweld in executive capacities. He is well known in the power, railroad communication and electrical circles, both in this country and abroad.

Volco Brass Names Vice President

Norman Coates, president of **Volco Brass & Copper Company,** Kenilworth, N. J., has announced the appointment of **Robert J. Campbell** as vice president in charge of sales. Mr. Campbell was formerly general manager of the N. Y. Brass & Copper Company. Prior to that, he was associated with Bridgeport Brass Company in a sales capacity. Mr. Coates said that Mr. Campbell's 20 years' experience in the brass industry will be an invaluable asset to Volco's sales and customer relations. Mr. Campbell will make his headquarters at Volco's general sales office in Newark, N. J.

Republic Steel Sales Changes

Republic Steel Corp., Cleveland, has appointed **Joseph K. Bole, Jr.** an assistant manager of sales in its bolt and nut division and **J. G. Wilsterman** in its wire division. **M. J. Cauger** was made assistant district sales manager, Chicago district, and placed in charge of the Milwaukee office. **Clydus F. Sells** was appointed superintendent, industrial relations, Warren, Ohio, district steel plants.



(ILLUSTRATED)
16"x11"x9" (250#Cap.) HEAVY DUTY PRECISION

Mossberg PRESSED STEEL Corporation

offers: **BALANCED PRECISION REELS in HEAVY DUTY construction for use on modern HIGH SPEED wire drawing machines.**

To provide higher operating efficiency, with the ever increasing tendency towards the drawing of finer gauge wire on larger reels at higher speeds, the following reel requirements are now essential:

BALANCE — DURABILITY — STRENGTH — ACCURACY
PROPER PROPORTION

All these requirements are incorporated in spools and reels made by

Mossberg PRESSED STEEL Corporation

18 WEST STREET ATTLEBORO, MASS., U. S. A.
TELEPHONE ATTLEBORO 1-0848 No. 101

Proven by wide usage—greater efficiency in **Serving and Braiding** *when packages of* **Silk-Nylon-Acetate** *are the product of our* **Mills.**

Producers also of **Tracer and Marker Trams** *which meet the* **Underwriters' Laboratory** *specifications.*

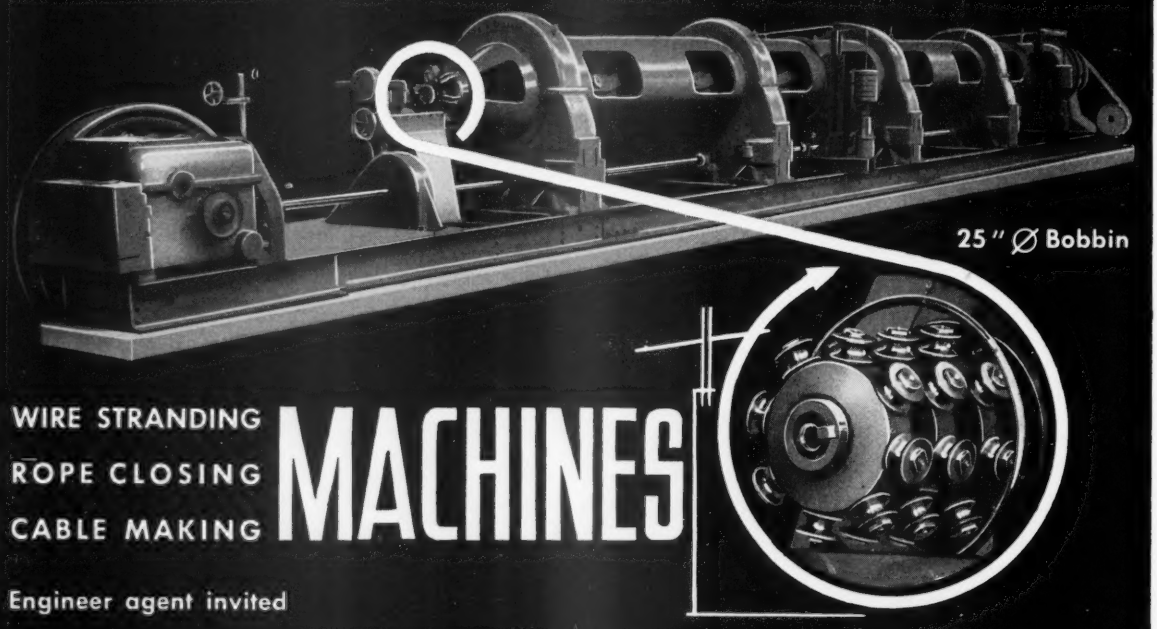
Consult us on your specific problems.

Belding Heminway

"Over a Century of Leadership"

Industrial Yarn Division 1407 Broadway, New York 18, N. Y.

NIEHAUS High-Speed Tubular Stranding Machine



WIRE STRANDING
ROPE CLOSING
CABLE MAKING

MACHINES

Engineer agent invited

MASCHINENFABRIK K. A. NIEHAUS · GERMANY
DÜSSELDORF-RATH

C.F.&I. Mill Appointments at Buffalo

V. L. Nicoli has been appointed superintendent of the wire mill at the Buffalo, N. Y. plant of **The Colorado Fuel and Iron Corporation's Wickwire Spencer Steel Division,** it was announced by **J. J. Martin,** vice president in charge of operations, CF&I.

★ ★ ★

Mr. Nicoli was formerly assistant superintendent of the wire mill. He joined the Buffalo plant's management staff in 1950, transferring from the South San Francisco Works of the **California Wire Cloth Corporation,** a division of Colorado Fuel and Iron.

★ ★ ★

L. P. McNamara, formerly wire mill general foreman at the Buffalo plant, has been named assistant superintendent of the wire mill.

★ ★ ★

The Wire Mill Department of CF&I's Buffalo plant is currently undergoing a modernization of facilities for producing hard drawn spring wire. With the installation of new wire drawing machines, expected to be in operation by the end of this month, the plant's production of this type of spring wire for the automotive, mechanical, bedding and furniture spring industries will be raised by an estimated 12,000 tons annually.

Norton Company Changes in Canada

W. Alexander McCune, Jr. has been appointed general sales manager of **Norton Company of Canada, Ltd.** A former abrasive engineer in the northern New Jersey area, Mr. McCune assumed his new duties November 1st. He will succeed **C. W. Fell** who will become an abrasive engineer in the Toronto area. Ill health has forced Mr. Fell to take a less strenuous part in the Company's sales program.

★ ★ ★

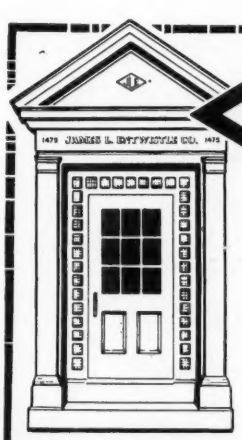
Winton A. Vagedes has been appointed an abrasive engineer and will assume Mr. McCune's former territory. He is a former department manager and abrasive specialist at the C. W. Marwedel Co. in San Francisco, a Norton distributor. He is presently completing a Norton training course.

★ ★ ★

Mr. McCune has been with Norton since 1940 except for two years during the War when he served as a Naval officer aboard a destroyer escort. A graduate of Dickinson College, he is a member of the American Society of Tool Engineers and American Society of Carbide Engineers.

Pennwoven Opens New Wire Cloth Plant in Florida

Pennwoven, Inc., with main offices in Grand Central Terminal Building, New York, and plant at Lock Haven, Pa., has started operation of a new wire cloth plant in Hialeah, the first major operation of this type in Florida. Ten looms have been installed, with 20 more to be in operation as soon as they can be set up. In the fall, after the Northern season for wire screen sales is over, an additional 30 looms will be moved to the new



JLE

SERVING THE WIRE INDUSTRY THROUGHOUT THE WORLD

- Caterpillar Pull-outs
- Standard Sets of Spark-Testing Equipment
- Take-ups and Re-spoolers
- Reelers
- Coilers
- Spoolers
- Collapsible Coiling Reels
- Wire Sparkers and Accessories
- Hand Locators
- Electrode Units and Stands
- Measuring Machines, Counters and Accessories
- Wire Guide Units
- Pay-off Reels Stands
- Electronic Devices
- Shaftless Take-ups and Payoffs
- Wire Pre-Heater
- Disk Brakes and Controls, Drag Units and Slip Clutches
- Wire Marking Machines, Type Strips, Inks
- Labelling Machines
- Pneumatic Equipment and Controls
- Special Machinery for the Wire Industry
- Hydraulic Equipment and Controls
- Hi-Pot Test Sets
- Cable Handling Equipment for Warehouse Use

See Page 1290 for News of JLE Shaftless Take-Up

JAMES L. ENTWISTLE CO.

1475 ELMWOOD AVE. PROVIDENCE 7, RHODE ISLAND, U. S. A.

European & South American Agents: M. CASTELLVI, INC. 150 BROADWAY, NEW YORK 38, NEW YORK

British Associate: GENERAL ENGINEERING CO., LTD. BURY ROAD, RADCLIFFE, LANCASTER, ENGLAND

JLE - JLE - JLE - JLE - JLE

Hialeah plant, which has 30,000 sq. ft. of floor space.

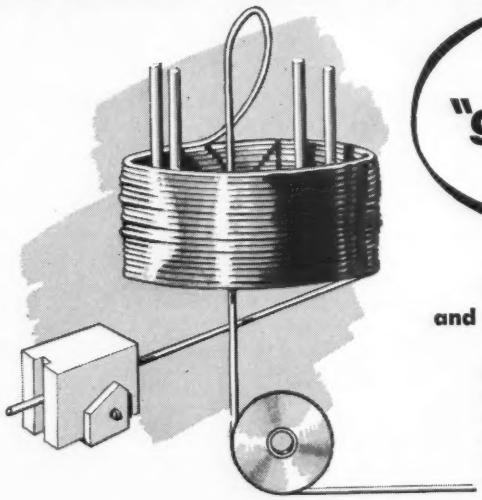
★ ★ ★

Pennwoven, Inc., whose president is **Benjamin J. Lewis,** will celebrate its 50th anniversary next year. It has maintained a warehouse in the Miami area, with sales in charge of George M. Corrigan, who will continue in that capacity. Seven Southeastern states will be served from the Hialeah plant, which will produce aluminum, bronze and galvanized cloth, the latter the company's Sylvanoid process. It will also make iridited steel cloth, a special zinc coating process to which the company has exclusive rights to manufacture.

Bohn Appointments

Bohn Aluminum & Brass Corp., Detroit, has appointed **Guy Pitts** as division manager of the brass and bronze division and the Michigan smelting and refining division. **Frank Turnbull** was made buyer of scrap material for the latter division at the same time the appointment of **David Walters** as Chief Industrial Engineer was announced.

DURPON* DRAWING COMPOUNDS



don't "get tired" easily

Initial performance is high, and they keep it twice as long!

Many soap lubricants for wire-drawing non-ferrous metals work well enough "the first time around." How well they perform when recirculated is another matter—which has a strong influence on the life of your expensive dies.

It's no accident that Nopco Durpon Drawing Compounds have double the effective life of ordinary drawing compounds. They are designed to have just that. A special additive prevents contamination of the effective drawing ingredients by dirt and by metallic particles . . . maintains the normal balance between soap and lubricant during re-circulation.

You gain two important economies from this lengthened stability. Nopco Durpon Drawing Compounds last longer . . . so do your dies.

All three types, Durpon, Durpon L and Durpon FW are natural lubricants; all are on the alkaline side (pH 8.0 to 10.5). Write today for technical bulletins and testing samples.

"stay stable longer"
DURPON
for intermediate wire
DURPON L
for rods, tubes, and heavy wire
DURPON FW
for fine wire

NOPCO
CHEMICAL COMPANY, Harrison, N. J.
BOSTON • CHICAGO • CEDARTOWN, GA. • RICHMOND, CAL.

*Reg. U. S. Pat. Off.

Canada Wire Buys Plant

Canada Wire & Cable Co., Ltd., Toronto, Ont., purchased a new plant in Smith's Falls, Ont., and will transfer equipment to the new unit from its Leaside, Ont., plant, according to James Y. Murdoch, president, in a recent announcement. The program will cost around $750,000.

Scovill Puts New Aluminum Strip Mill into Production

C. P. Goss, vice president in charge of mill sales for Scovill Manufacturing Company, has announced that the company's new aluminum strip mill is now in production.

★ ★ ★

One of the innovations introduced in the new mill is the use of furnaces, the first of their type, whereby all aluminum production is annealed under complete atmospheric control with a substitution of nitrogen for oxygen. This controlled atmosphere in a bell type furnace is injected after all oxygen, carbon dioxide, and oil have been forced from the enclosure. The nitrogen atmosphere minimizes oxides from forming on the aluminum strip surfaces, thereby reducing for fabricators the costly cleaning and finishing operations.

★ ★ ★

Scovill was a pioneer in rolling and fabricating strip aluminum in 1889, just as it was the first American brass producer in 1802. The new aluminum strip is the result of many years of research and experimentation by company engineers in an effort to closely control grain size, temper, directional properties and dimensions. This new development makes it possible to minimize "orange peel" and "earring" effects and is believed to set new quality standards for aluminum strip on a commercial basis.

Engineer Joins Carboloy

John H. Smedley, a graduate of General Electric Company's advanced engineering and test programs, joined the **Carboloy Depart-**

ment of **General Electric Company** as design and application engineer in the permanent magnet products design and application section. He is an electrical engineer from the University of Michigan.

Join Carboloy in Carbide Section

Bernard E. Speranza, a metallurgical engineer with General Electric Company's chemical and metallurgical training program, joined the **Carboloy Department** of **General Electric Company** as an engineer in the carbide materials development section. Mr. Speranza is a graduate metallurgical engineer from Carnegie Institute of Technology.

To Handle Purchases for Fastener Concern

F. J. DeCrane has been made director of purchases of **Lamson & Sessions Co.,** Cleveland, and **L. J. Miller** their purchasing agent. Mr. DeCrane succeeds **G. W. Hinds,** who after 36 years retired from the company August 15. Mr. Miller succeeds Mr. DeCrane.

Frank Mossberg

Frank Mossberg, dean of former city officials here, a pioneer in the manufacture of heavy machinery in Attleboro, and an inventor with hundreds of recorded patents in his name in the Federal archives, died on October 15th in the Sturdy Memorial hospital. He had been under medical care for five days. He gradually failed after entering the hospital following a stay at his home after previous hospital treatment.

★ ★ ★

He lived with his daughter, Mrs. Florence Van der Pyl at 141 Pleasant st. To hundreds of Attleboro friends he was known as "The Chief," a lively man who was reaching toward the century mark. He had been looking forward to his birthday, Nov. 8., when he would have reached 95.

★ ★ ★

A native of Sweden, Mr. Mossberg came to the United States at 19 years of age as a steerage passenger aboard a slow boat, without money and with his vocabulary limited to a request for a job in the language of the country he was about to enter.

★ ★ ★

Arriving in New York, Mr. Mossberg made use of his limited English, obtained work at 10 cents per hour, saved enough for a ticket to Connecticut, labored there in a mill, migrated to Providence, thence to Attleboro in 1889.

★ ★ ★

Utilizing his small savings to launch himself as a machine shop operator, Mr. Mossberg opened a small business. The late C. L. Watson, recognizing that Mr. Mossberg had ability, gave him an order for some jewelry equipment and for the long climb which would result in Mr. Mossberg becoming a leading industrialist, began.

★ ★ ★

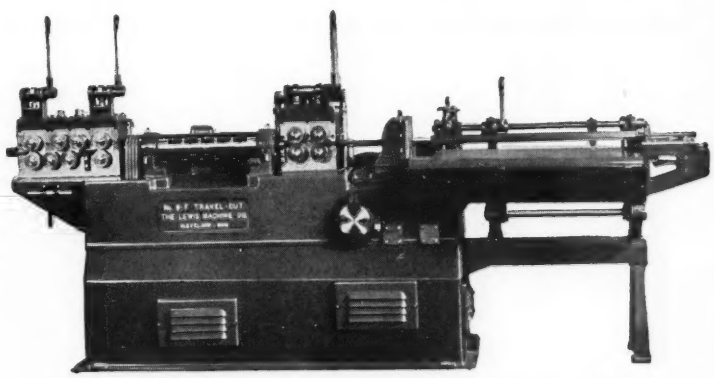
Mr. Mossberg labored to perfect hand presses and machines for

(*Please turn to page* 1360)

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS TRAVEL-CUT



22 Models to handle from .012" to ¾" Round, Hex, Flat, Shapes.

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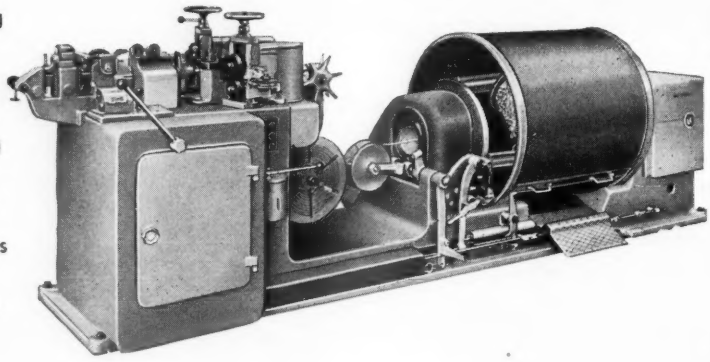

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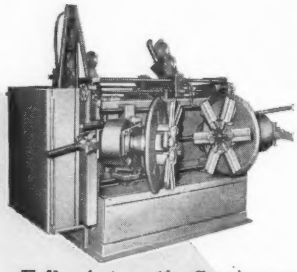

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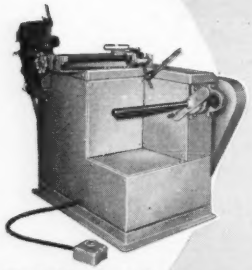

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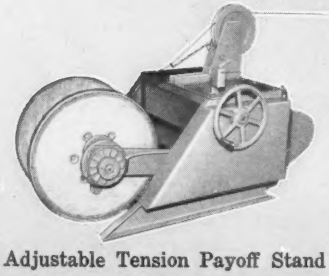

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A Review of Recent Wire Patents

No. 2,654,099, ANTIPUCKERING MEANS FOR SOFA BED UPHOLSTERY, patented October 6, 1953, by Paige W. Ake and John T. Lester, Tampa, Fla., said Ake assignor to said Lester.

Wire helical springs—containing sofa beds are provided with a new form of anti-puckering means not interfered with by the springs.

No. 2,654,284, SCREW WITH SELF-DRILLING END, patented October 6, 1953, by Leonard O. Schevenell, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

A combined aperture and thread cutting screw fastener is disclosed having a free end portion provided with a blade and a notched end.

No. 2,654,401, METHOD OF MANUFACTURE OF GRID STRUCTURES, patented October 6, 1953, by Victor Joseph Legendre, Vauxhall, and Jerome Vincent Volk, Union, N. J., assignors to Tung-Sol Lamp Works, Inc., Newark, N. J., a corporation of Delaware.

The wire grids of the structure are secured in place by steps including the cutting of notches in the soft metal support rods and employing the metal forced out in the cutting of the notches to hold the wire of the grid structure.

No. 2,655,193, APPARATUS FOR BENDING TUBING INTO SERPENTINE FORM, patented October 13, 1953, by Arthur W. Payne, Detroit, Mich., assignor to Bundy Tubing Company, Detroit, Mich., a corporation of Michigan.

There are twenty-two claims to this apparatus which includes two arbors and bending pads pivotally mounted near the arbors for moving about their respective arbors.

No. 2,655,194, APPARATUS FOR PROCESSING ROUND BARS AND TUBES, patented October 13, 1953, by Einar W. Nilsson, Youngstown, Ohio.

This is a cross roll machine for advancing, rotating and processing round stock and includes a roll for forming a pass for such stock.

No. 2,655,267, COMBINATION DRAINER BASKET AND RECEPTACLE SUPPORT, patented October 13, 1953, by Paul H. Planeta, East Hampton, Conn.

A detachable supporting rack is disclosed, constructed of bent wire. There are sixteen claims.

No. 2,655,325, STRAND GUIDING AND TENSIONING DEVICE, patented October 13, 1953, by Arthur Kuettler, Jr., Berwyn, and Fred Radakovich, Chicago, Ill., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

An adjustable rotary device for applying a variable tension to a moving strand of wire is provided. Six claims.

No. 2,655,952, METHOD OF FORMING LAMP FILAMENTS, patented October 20, 1953, by Oliver Mann, Danvers, and Ralph B. Thomas, Beverly, Mass., assignors to Sylvania Electric Products, Inc., Salem, Mass., a corporation of Massachusetts.

A method of forming an electric lamp filament from a continuously uniform wound coil of filament wire in which the filament has a number of coil segments with a filament supporting full circular loop between each pair of segments is disclosed.

No. 2,655,954, LEAD WIRE FEED MECHANISM FOR LAMP STEM FABRICATING APPARATUS, patented October 20, 1953, by Stanley J. Gartner, Emporium, Pa., and Samuel E. Swasey, Marblehead, and Dwight J. Dwinell, Reading, Mass., assignors to Sylvania Electric Products, Inc., Salem, Mass., a corporation of Massachusetts.

This patent is said to be related to U. S. patent 2,637,144, dated May 5, 1953.

No. 2,655,973, SPRING COILER, patented October 20, 1953, by Edward H. Hoelsch, Worcester, Mass., assignor to Perkins Machine & Gear Company, West Springfield, Mass., a corporation of Massachusetts.

This is a hand-operated coiler which may be set for different sizes, and types of spring.

No. 2,656,124, COIL WINDING MACHINE, patented October 20, 1953, by Clarence C. Stevens, Forestville, Conn., assignor by mesne assignments to West-

(*Please turn to page* 1363)

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(*Continued from page* 1304)

used for stopping from all speeds. This will mean that stopping from low speed will be in distinct steps instead of being near uniform. The winding tension will, therefore, change over each step. The required spooler deceleration compensation at the beginning of each step if a constant compensation is used, might allow slack wire or slippage just before the beginning of the next step. Fig. 17 shows the wound rotor drive scheme and its response.

★ ★ ★

Another wound rotor drive that might be applied for the above stopping conditions would use a primary torque limiting resistor like that discussed previously for the two speed motor coarse wire machine drive shown in Fig. 15. In this case, selected reduced torques for each stopping condition can be provided as shown in Fig. 18.

★ ★ ★

Direct current dynamic braking with the D.C. power supplied by a rectifier is shown in both Fig. 17 and 18. It is used only on emergency stops and is usually arranged to give an average braking torque of about 125 to 150% of the motor full load running torque.

The Constant Potential Direct Current Drive

The constant potential direct current drive is shown in Fig. 19. This drive is arranged for nearly uniform acceleration to and from any preset speed in a selected constant time. The accelerating rate, and hence the spooler inertia compensation required, will therefore, be a function of the selected operating speed. The drive shown is for a 3 to 1 speed range. Higher ranges can be had by applying the proper motor. The spooler to work with this machine should be able to apply a stepless inertia compensation proportional to selected operating speed or motor field rheostat position. This drive's advantage over the wound rotor drive is, 1) a stepless speed range and elimination of a gear change unit, 2) a compound wound motor to give more suitable torque characteristics for a uniform starting and stopping 3) allows better spooler performance than the wound rotor drive.

★ ★ ★

The drive shown in Fig. 19 is arranged for dynamic braking on emergency stops.

The Adjustable Voltage Direct Current Drive

The adjustable voltage direct current drive shown in Fig. 20 is the ideal drive for wire machines with separately powered spoolers. When equipped with a motor operated rheostat and a present control the starting and stopping times are proportional to preset operating speed. Accelerating and decelerating rates are therefore, constant and spooler inertia compensation need not be changed as operating speed is changed. The only time inertia compensation needs to be changed is when spool size is changed.

★ ★ ★

Refer again to Fig. 20 and note

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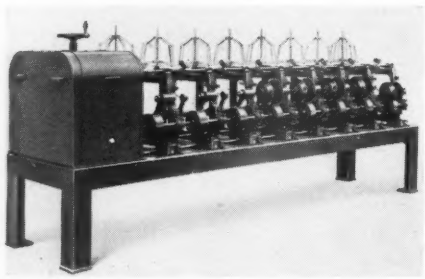

- Constant Linear Speed of the Wire. Therefore Increased Production
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how the drive torque is a straight line response with the drive just producing enough torque to do the wire work and accelerate the machine. Also, the machine acceleration torque is a constant and is independent of operating speed.

★ ★ ★

Dynamic braking is provided for emergency stops. The motor operated rheostat is arranged with a reset so that when an emergency stop is initiated the rheostat returns automatically to zero speed position and the controls are locked out until this position is reached.

Drives for Separately Powered Spoolers

As stated previously various combinations of drive equipments have been used at times to power separate spoolers. They all are common in that they should develop the following:

1) **A torque that varies directly with spooling or package diameter and is independent of speed. This is the drive torque that maintains wire or spooling tension.**
2) **A component of torque that is positive during starting periods and negative during stopping periods for spooler and spooler drive inertia compensation. The magnitude of this inertia torque during starting and stopping periods should be equal to the spooler inertia times the acceleration rate in order that the tension torque above be unaffected.**
3) **Finally, a component of torque to overcome spooler friction and windage. The torque for friction and windage on these larger spoolers is usually small compared to tension torque and is, therefore, either neglected or compensated for, by a small additional component of constant torque.**

★ ★ ★

Most spooler drives fall short in that they only approximate the above torques, and also must be given special consideration as to acceleration rate, partial spool starting requirements and so on. This is natural since spooler drives to handle all combinations of the variables that can occur during a drawing machine start, run and stop cycle would be unduly complicated and expensive. Drawing machine starting and stopping characteristics and operating procedure is, therefore, usually arranged to simplify spooler drive requirements.

Two all electric drive equipments for spooler application are commonly used. The first employs the straight line speed-torque response of an induction motor with high motor winding resistance to approximate the desired constant horsepower response. Its application is limited and its efficiency is low.

★ ★ ★

The second spooler drive uses an adjustable voltage direct current drive with a constant current type regulator for tension control. It makes a much better spooler drive giving accurate tension control with good spooling power efficiency. However, it still requires a uniform drawing machine speed response during starting and stopping periods to allow a constant magnitude inertia compensation to maintain accurate tensions during these periods.

The Wound Rotor Spooler Drive

See Fig. 21 curves "a" and "b" indicate constant horsepower spooling buildup ratio and a four to one tension range at 50% maximum machine speed. Curves "c" and "d" are for the same spool and spool buildup at 100% machine or wire speed. Lines "f" and "g" represent drive stall torque lines to give respectively 10 and 40 pounds tension at 2020 feet per minute on a 12 to 24 inch diameter spool. Note how, at the start of spool buildup on low wire speed, the empty spool tension will be about

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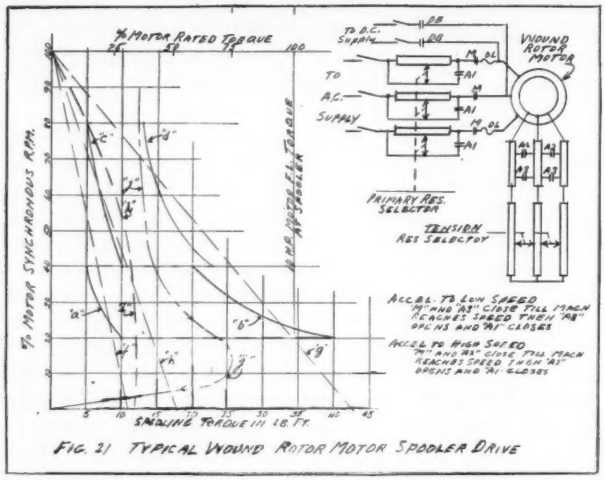

FIG. 21 TYPICAL WOUND ROTOR MOTOR SPOOLER DRIVE

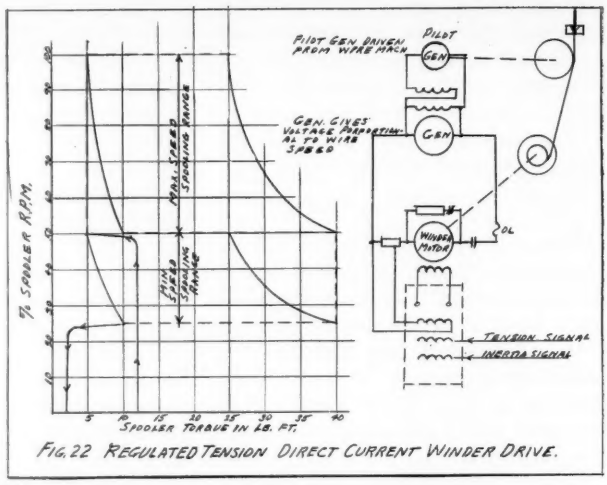

FIG. 22 REGULATED TENSION DIRECT CURRENT WINDER DRIVE.

20% high and as the spool fills up, this error decreases and finally becomes about 20% low at full spool. The error for the high speed spooling, see curves "c" and "h", is just the opposite, low at the start and high at the finish. The tension variations of the example are about plus or minus 20%, or 40% overall. Also, spooler friction and wire bending work, not taken into account in the above, will cause additional errors that cannot be compensated at all operating conditions. The tension error may, therefore, be slightly higher than the plus or minus 20% shown.

★ ★ ★

The maximum tension of the high speed, 4040 feet per minute, curve "d" will be about 21 pounds or near one half the maximum tension at low speed. Also, the minimum value is about 6 pounds. This comes about from the slope of the high resistance motor response curves. The various positions of tension selector will, therefore, give different spooling tensions depending on spooling speed.

★ ★ ★

At maximum tension and low machine speed the average spooler RPM will be about 390 or 25% motor speed. The motor power input over a spooling cycle will, therefore be four times the average

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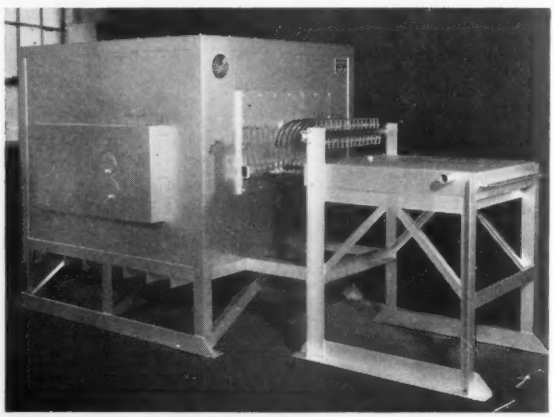

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wire spooling work.

★ ★ ★

In the example (2020 f.p.m. x 40# ÷ 33,000) x 4 or a 10 horsepower forced ventilated motor will be required to perform about 2½ horsepower of work. If forced ventilation is not used, a 30 horsepower motor will be required to do the 2½ horsepower of useful work. The 30 horsepower motor would have the same 10 horsepower rotor input (⅓ load) and 7½ horsepower rotor loss.

★ ★ ★

During starting periods resistance is inserted in the stator circuit to limit pullout torque to a low value. This, with just enough rotor resistance to drop the pullout point to about 50% speed, gives a nearly vertical response as is required for a uniform acceleration. Curve "i" shows a typical accelerating response obtained by the above procedure. A series of about 4 to 7 selected accelerating responses are usually provided. The proper one is then picked for the different starting conditions.

★ ★ ★

Normal stopping is usually accomplished by a combination of direct current dynamic braking and wire tension. The braking curves are of the same general shape as the curve "j" but of opposite torque direction than that shown. Usually about 4 different braking responses are provided. The best one is selected for each set of braking conditions. Relatively fast stops with little tension control are usual. A friction brake does the final stopping and holding with final stop being slightly ahead of the drawing machine.

★ ★ ★

The performance of the wound rotor spooler drives with small wire, different spooling speeds and with different size spools is only approximate at best. Also, final adjustments in the field to suit particular conditions are not easily made. It will, however, do a good job when spooling large, high spooling tension, wire at low speeds.

The Regulated Tension, Adjustable Voltage, Direct Current Spooler Drive

The regulated tension direct current spooler drive is shown in Fig. 22. This figure is for the same spool size, wire speed and tension range as the wound rotor drive of Fig. 21. The direct current motor for this example must have a speed range by field control slightly greater than the 2 to 1 spool buildup range. The horsepower must be equal to, or slightly greater than the low speed spooling horsepower times the wire speed range or (2020 f.p.m. x 40# ÷ 33,000) x 2 = 4.9 or 5. The generator must have sufficient capacity to drive the motor, or a 5 kilowatt rating.

★ ★ ★

The characteristics of the regulated tension drive are such that it inherently produces a constant horsepower response identical to that required for constant winding tension. One tension selector setting gives the same spooling tension on any spool size and at any

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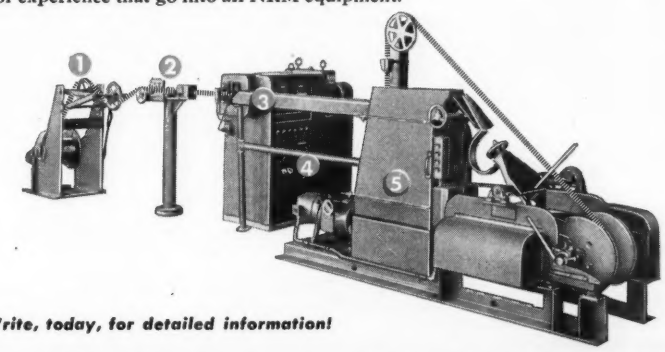

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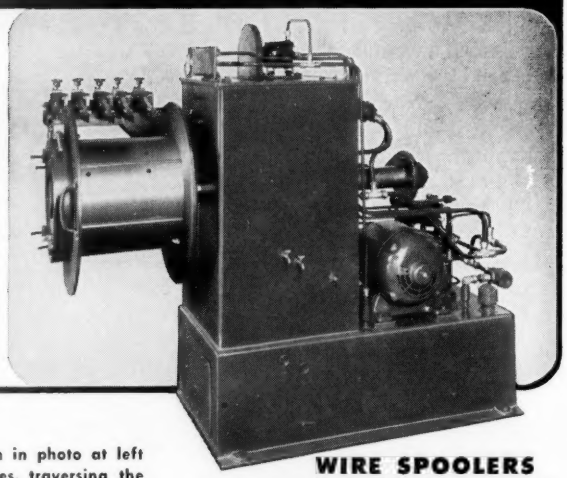

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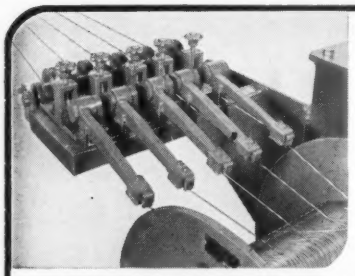

Method of coiling is shown in photo at left The complete block oscillates, traversing the wire into five 3" wide coils. Traverse and tension control are extremely accurate. 1/8" to 1/2" wide flat wire can be wound. Block has 16" inside diameter and 24" outside diameter.

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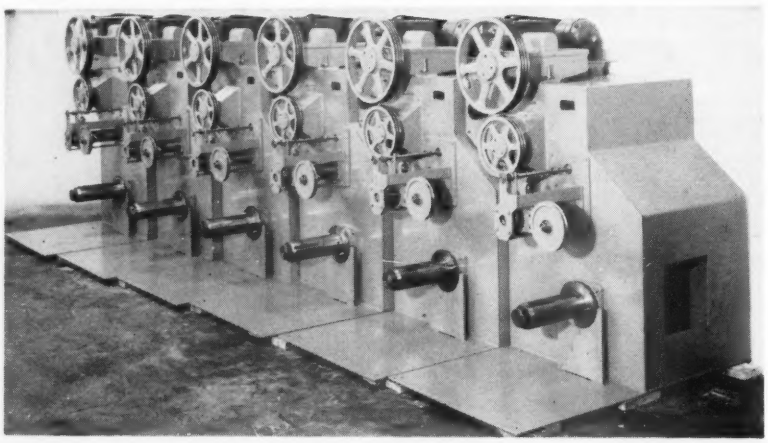

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spooling speed within the spool buildup and spooling speed range for which the drive is designed.

★ ★ ★

A pilot generator driven by the drawing machine causes the spooler drive generator voltage to match wire or spooling speed at all times. The spooler motor, therefore, has the correct armature voltage required to give the proper speed response at any speed during starting, running and stopping periods. The regulator works on the adjustable speed spooler motor field to maintain constant any selected drive current. As the spool builds up the spooler motor slows down. As this happens the armature current tries to increase, but this causes the regulator to increase the motor field strength and maintain the selected current. The net result is that current is held constant and field strength is always maintained directly proportional to spooling diameter. Since motor torque is always proportional to armature current times field strength, this drive produces a torque that is directly proportional to the spooling diameter. The inherent drive response, therefore, is as required for constant tension spooling. The only errors that can enter in come from friction losses in the winder itself, and from the work required to bend wire to the spool diameter. These losses on most applications are small enough to be neglected.

★ ★ ★

During starting and stopping periods an inertia compensation signal is fed to the regulator. This signal adds to, or subtracts from the tension signal and causes the regulator drive current to change to some new value required for proper drive torque during starting and stopping. If the inertia signal during stopping is strong enough to overcome the tension signal the drive current will reverse to pump current back to the spooler generator. Or in other words, a regulated regenerative braking can occur for relatively fast stops with regulated tension control still being maintained.

★ ★ ★

The inertia signals are constant in magnitude, therefore, uniform machine starting and stopping is required if accurate tension control is to be had. However, if starting and stopping periods are reasonably long, only small inertia compensation torques will be required. Slightly non-uniform accelerating and decelerating rates then cause only small tension errors. Also tension control in the usual spooler application need be just good enough to allow satisfactory starting and stopping. The regulated spooler drive can always more than satisfy these conditions.

On emergency stops the spooler motor is disconnected from the generator and braked to rest by a mechanical brake. This brake also does the final stopping and holding on normal stops.

★ ★ ★

Since all control functions are by controlling very small regulator control field currents, the operator's control station is small and simple. The usual station contains an ammeter to indicate spooling tension and a small tension selector rheostat to give stepless tension selection anywhere within the ten-

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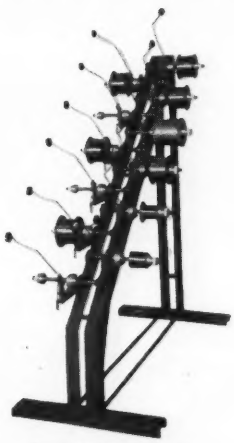
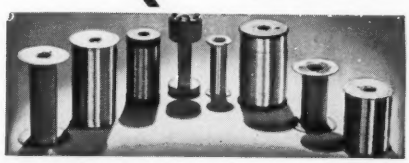
WITH THIS WINDER

Wire Winder



Pay-off Attachment



Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAYOFF

Our payoff attachment is made with self-aligning ball bearings and a compensating attachment to control the tension of each end. Applies same tension when spool is empty as when full.

The new Uni-Drive Winder with Payoff Attachment is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel—no over or under-winding. Automatic Stop-Motion controls each strand. Compensating attachment produces perfectly controlled tension. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors up to ¾" diameter.
Payoff can be equipped with Carboloy Guide Inserts at additional cost.

STANDARD MILL SUPPLY COMPANY
PAWTUCKET, RHODE ISLAND, U.S.A.
1064-1080 Main St.
PAwtucket 3-1534 — 3-1535 — 3-1536

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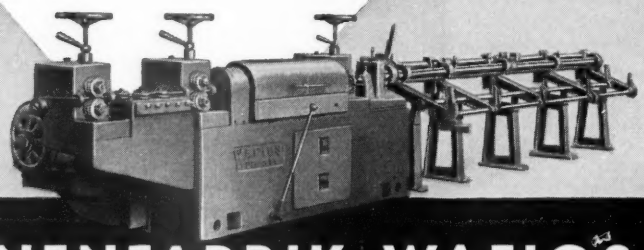
WIRE-WORKING MACHINERY

Wire Netting Machines for Chain Link, Hexagonal Mesh, Poultry Netting, Field Fence. Crimping, Barb Wire and Staple Machines. Spring Coilers. Spring End Grinding Automatics. Loop Benders. Upholstery Spring and Wire Mattress Machines. Wire Nail Machinery. Chain Formers. Chain Welders. Straightening and Cutting Machines. Multi-Slide Wire and Strip Forming Machines. Special Machinery for the making of Paper Clips, Lock Washers, Bale Ties, Key Rings, Tin Openers, Wire Bag Ties, etc. Automatics for Flexible Metallic Tubing.

Sole Agents for Australia and New Zealand: Bliss & Reels Co. Pty. Ltd., 64-66 Little Bourke Street, Melbourne C. 1, Australia.

WAFIOS

SINCE 1893



MASCHINENFABRIK WAFIOS

WAGNER, FICKER & SCHMID REUTLINGEN 3 / WÜRTT. GERMANY

Vitron
GLASS FIBER
TEXTILE YARNS
ELECTRICAL INSULATION • PLASTIC REINFORCEMENT • CURTAINS AND DRAPERIES
INDUSTRIAL AND DECORATIVE COATED FABRICS • PAPER SHEET AND TAPE REINFORCEMENT

Q. What process means *uniformity* in glass yarns and fabrics for superior quality glass-plastics products?

A. It's Electronic-Extrusion—the advanced process for glass fiber manufacture—developed, patented and used exclusively by Glass Fibers Inc.

This 8-page booklet will give you the "what" and the "why" on VITRON Glass Fiber Yarn from raw glass batch to finished package. The new glass fiber nomenclature, property tables, synthetic fiber comparison charts are all here too.

Glass Fibers Inc.
Dept. IM-352, 1810 Madison Ave.
Toledo 2, Ohio

Please send me your 8-page booklet on Vitron Glass Fiber Yarns.

Name .....

Company .....

Address .....

City ..... State .....

sion range. This rheostat is coupled to a second small rheostat that gives a stall tension on initial starts. The stall tension is always in step with and slightly less than the selected running tension. And usually, two small inertia compensation selectors, one for speed, and one for spool size. Often the speed compensation selector can be incorporated in the machine control so that the proper speed inertia compensation is selected automatically.

Drawing Machine Control Panels and Relative Drive Costs

Control panels for wire drawing drives, except those in the cubicles of adjustable voltage package drives, are usually furnished in Nema I or IA enclosures. The direct current panels usually have front mounted and back wired control components on ebony asbestos or similar panelboards. The alternating current control panels can usually be had in the front mounted, back wired ebony asbestos construction, or front mounted and front wired on steel panels.

TABLE I

RELATIVE COSTS OF TYPICAL WIRE DRAWING MACHINERY ---------- Based on Wound Rotor Drive Costs	Single Speed Sq.Cage Motor Drive	Two Spd. Constant Torque Sq.Cage Motor Drive	Wound Rotor Motor Drive	Constant Potential D.C.Motor Drive for 2 to 1 Spd.Range	Adjustable Voltage D.C.Drive 2 to 1 Fld Spd. Range
Fine and Coarse Wire Machines with Integral Spoolers	40%	60%	100%	150%	X
Large to Heavy Low Speed Machines for Operation with Separate Spoolers	X	50%	100%	150%	300%
Low Speed Spoolers for Large to Heavy Drawing Machines	X	X	100%	X	200%
Heavy to Intermediate High Speed Machines for Operation with Separate Spoolers	X	X	100%	125%	200%
High Speed Spoolers for Heavy to Intermediate Drawing Machines	X	X	100%	X	110%

The front wired steel panel construction is usually neat and offers ready accessibility to all wiring. It also costs slightly less than the insulated panel construction.

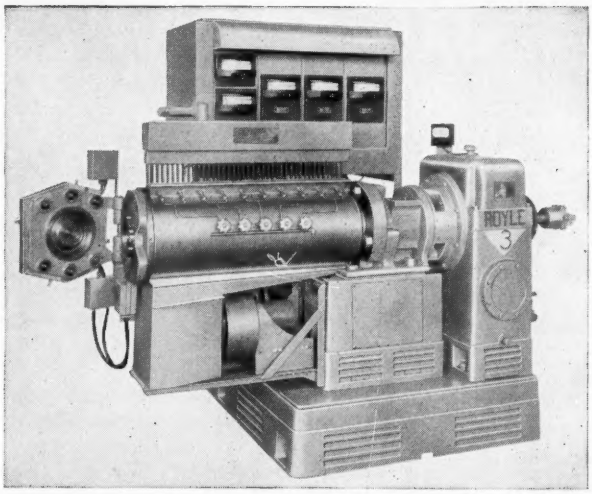
★ ★ ★

The power type resistors of constant potential controls can be furnished either for separate mounting and wiring by the customer on installation or they may be factory wired and assembled in screened enclosures on either the top or sides of the control cabinet.

★ ★ ★

Small factory made operator's

FASTEST HEATING FASTEST COOLING



Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

- **Extra heavy walled cast steel cylinders that will not warp. No joints to leak when pressures are high or crevices to collect burned compound that would cause contamination.**
- **Heavy duty large diameter heating elements, that can be used with 440 volts without step-down transformers, provide radiant heat to cylinders and heads.**
- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
- **A cooling system with ten times the capacity of conventional designs can be modulated through its entire temperature range without drastic changes. Ample cooling for all compounds at maximum speeds.**

No. 3 Royle Spirod Extruder. Completely insulated and equipped for evaporative cooling.

*Patent Applied For

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England — James Day (Machinery) Ltd. — REgent 2430
Home Office — V. M. Hovey J. W. VanRiper — SHerwood 2-8262
Akron, Ohio — J. C. Clinefelter — SWandale 4-5020
Los Angeles, Cal. — H. M. Royal, Inc. — LOgan 3261

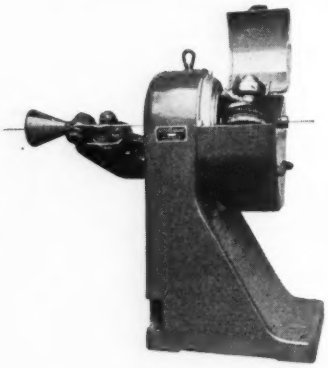
PATERSON 3, NEW JERSEY

LINÉ-GORCY

MECHANICAL

WIRE ROD DESCALERS

(Patented in U.S.A.)



Built for—
Efficient
Low Cost
Dry Cleaning of
Hot Rolled Rods

PROOF IN 1953!

1.—The excellent, productive performance of the

LINÉ-GORCY DESCALER

has been fully demonstrated in

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2.—Likewise, the excellent performance of the

WEMCO MOLTEN METAL PUMP

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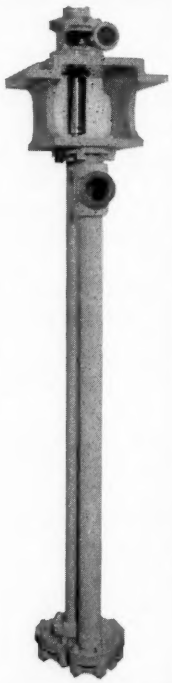
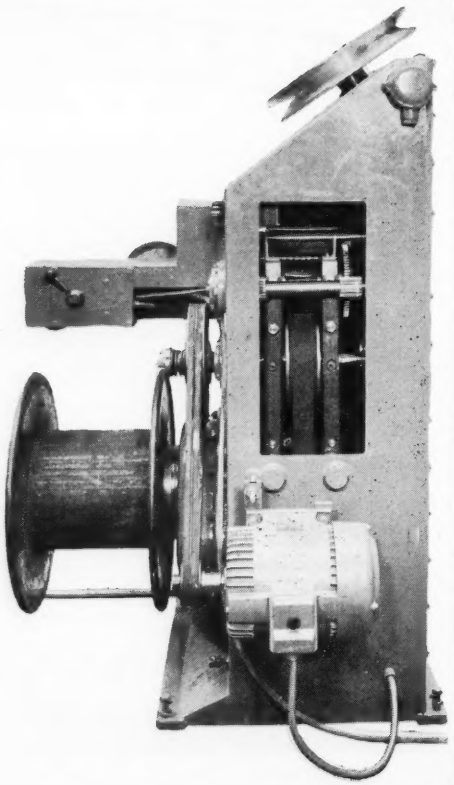


POURTIER SHOWS TO U.S.

his Take-up for Tinned Wires

- Instead of receiving in coils the tinned wire, you will save one re-winding operation by using our patented device. You will receive directly on drums up to 30", wires from 8 to 22 Awg.
- Constant linear speed: no capstan, no contact on the drum. The regulation is obtained by 90° around a pulley. This pulley acts on an automatic speed-changer at each new spiral of wire. This pulley is itself driven through a regulated friction and irreversible gears. No excessive tension, even on the fine wires.

Speed regulated from 60 to 200 yards/minute. Discharge of full drum by pneumatic jacks. Traverse adjustable in speed and width, positively linked to the rotation of the drum. Dimensions: 3′ x 3′ x 4′ Weight: 600 lbs. Supplied with 3 HP motor, electric equipment and counter.



POURTIER MACHINES

153, rue Gallieni, ROMAINVILLE (Seine) FRANCE

control stations to contain all push-buttons selector switches and indicating devices for machine and spooler operation usually allow installation and operating conveniences far in excess of their cost. They allow all operating procedures to be performed from a convenient control location and can be arranged for either wall, machine or pedestal mounting.

★ ★ ★

In conclusion, the relative drive costs taking the wound rotor drive as a basis will usually be about as indicated in Table I. These relative costs with the foregoing performance and drive descriptions while general in nature, should be of help in selecting economic and adequate electric drive equipments for most wire drawing machinery applications.

Anaconda Develops Only "Solid" TV Line

All-channel reception in both UHF and VHF for all weather conditions has been made possible by the introduction of a new form of low loss insulation—Foamed Polyethylene—in a new lead-in line developed by **Anaconda Wire & Cable Co.,** Hastings-on-Hudson, New York. Known as "ATV-270 FOAM," the line is easy to terminate—only a skilled hand and a penknife needed.

★ ★ ★

ATV-270 FOAM was developed to solve an old problem in UHF-VHF television reception—internal moisture condensation. The Foamed Polyethylene provides a one-piece insulation which virtually eliminates the problem and adds considerably to the line's fine attenuation characteristics.

★ ★ ★

Construction-wise, the line consists of two high-strength conductors firmly enclosed and accurately spaced within the brand new compound. Foamed Polyethylene's cellular construction gives it superior low loss qualities and makes it particularly suitable for high frequency applications. In addition, the new compound has good resistance to weather, sunlight and abrasion.

★ ★ ★

Anaconda Wire & Cable Co.'s Research and Development Engineers have been working with engineers of radio and television manufacturing corporations for some time in their search for a line that would perform equally well in wet weather and dry. It was well known that semi-solid construction may be subject to moisture difficulties. This problem led Anaconda research men to consideration of possible one-piece constructions and resulted in development of Foamed Polyethylene compounds and the present line, ATV-270 FOAM.

Made Section Manager by Carboloy

Frank B. Nuelle, a member of the engineering administration section at **Carboloy Department of General Electric Company** since October, 1951, has been named manager of that section. He is a former supervisor of General Electric's chemical and metallurgical training program, Schenectady, N. Y. He has a B.S. degree in metallurgy from Notre Dame University.

DRY DRAWING STEEL WIRE?

Make a test run with

NOPCO* DD
the NEW Stearate Type Lubricant

With quality dies at today's high cost, you have everything to gain by trying Nopco DD.

You may find you have doubled the life of your dies. One New England manufacturer indeed, got 12,000 pounds of wire through finishing dies using DD, while with lubricants previously used, his average was 6,000 pounds.

Note that the melting point of Nopco DD is higher than 250° C. This means, of course, that the lubricant lasts longer than lower melting lime soaps of comparable price. Prolongs die life. Produces better wire.

We want you to try this new lubricant . . . to compare results where they count, in the actual working conditions of your own shop. We'll be glad to help by furnishing full information, and samples for testing. Write today.

NOPCO DD, for dry drawing steel wire

PRODUCT DESCRIPTION

A specially processed, high melting point, modified fused calcium stearate type lubricant.

Appearance	—White powder.
Moisture	—Less than 1%
Melting Point	—More than 250° C.
	USES
Type Wire	—High and low carbon steel.
Size of Wire	—Rods to 16 gauge.
Speed of Draw	—1500 to 2500 ft. per minute, and faster.
Number of Dies	—Two to seven dies.

NOPCO
CHEMICAL COMPANY, Harrison, N. J.
BOSTON • CHICAGO • CEDARTOWN, GA. • RICHMOND, CAL.

*Reg. U. S. Pat. Off.

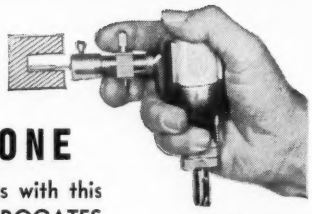
For wet drawing nonferrous metals try:
DURPON* (for intermediate gauge wire)
DURPON L (for heavy wire, rods, tubes)
DURPON FW (for fine wire)

REPAIR DIES
OF CARBIDE OR STEEL

FASTER WITH **Di-Profiler** TRADEMARK

28,000 FILING STROKES

per minute with this precision hand tool that operates virtually without vibration. A foot controlled rheostat gives you any filing speed you want.



Regulated stroke 0" to .250"

Hundreds are in daily use. Cost is low and the wide variety of uses are covered in a 50 page hand book of great technical value furnished FREE with each Di-Profiler. ORDER YOURS NOW or ask for a demonstration.

FILE, GRIND, LAP, HONE

and perform innumerable other functions with this new work reducing tool that RECIPROCATES OSCILLATES or ROTATES when spindle attachment is used.

50 TIMES FASTER THAN HAND FILING!

Furnished complete with universal motor and flexible shaft drive, ready for immediate repair use on round, flat or shaped dies, will even make new dies from carbide after center hole is drilled. Does in minutes what would normally take hours and enables you to repair dies, often without even removing them.

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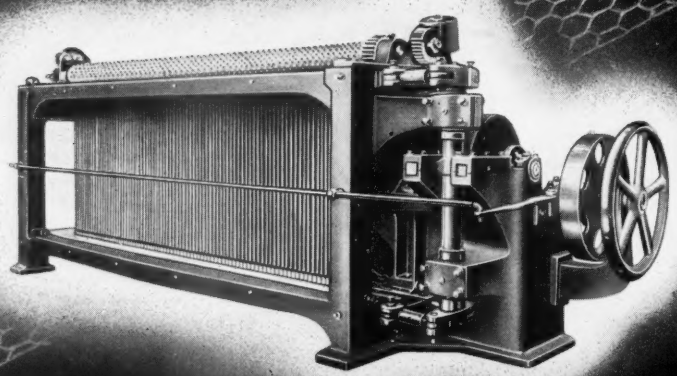
We build again: **Hexagon Wire Netting Machines**

Mesh widths $^{1}/_{4}$" - 4"
Working widths 3' - 12'
for wire BWG 22 - 13$^{1}/_{2}$



Model TUDN

SINCE **MALMEDIE** 1873

MASCHINENFABRIK GM BH DÜSSELDORF / GERMANY

New Seal for Bolts and Studs

A new sealing device for safe, sure, sealing of bolts and studs at either high or low pressure, gas, liquids, or air, has been developed by **Franklin C. Wolfe Company,** sealing design specialists of Culver City, California.

★ ★ ★

This new device, called the Stat-O-Seal, has been thoroughly tested and is now in use in many applications in industry. The Stat-O-Seal uses the principle of controlled confinement of the sealing gland as proved in the company's Lock-O-Seals, widely used throughout industry. The Stat-O-Seal is one-piece construction, and non-directional. It cannot be assembled upside-down. The sealing gland in the Stat-O-Seal is mechanically fastened to the metal retainer, which eliminates the possibility of failure of a chemical bonding agent. Use of the seal will save time, effort and the possibility of mal-assembly by unskilled workers.

★ ★ ★

It obsoletes the need for sealing "goop" over bolts and studs. They do not require high fastening torques to seal as there is always full metal to metal contact without any load transference to the sealing gland. Nor is there loss of sealing from "cold flow" with Stat-O-Seals. They are re-useable. Information is available upon request from Franklin C. Wolfe Company, 3644 Eastham Drive, Culver City, California.

Brings Out Hand Operated Spring Coiler

The O'Neil-Irwin Manufacturing Co., 635 Eighth Avenue, Lake City, Minnesota, U. S. A., manufacturers of Di-Acro Precision Metalworking Machines, announce the addition of a new spring winding machine.

★ ★ ★

The Di-Acro Spring Winder, according to the company, is a complete self-contained unit with a special cut-off lever incorporated right into the machine. It can be used to form individual springs, or

AETNA-STANDARD WIRE DRAWING UNIT

- DESIGNED FOR COMPLETE VERSATILITY
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- SINGLE OR MULTI-DRAFT OPERATION
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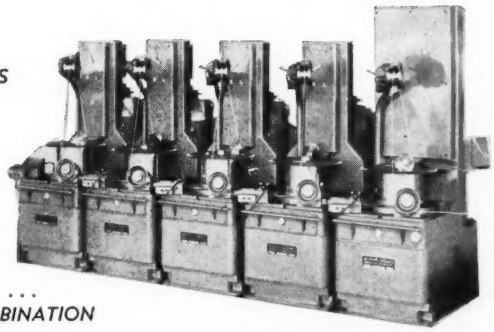

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SINGLE UNIT ... OR ANY COMBINATION

THE AETNA-STANDARD ENGINEERING CO.
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Announcing a Completely New
SPARK TESTER

FEDERAL is proud to announce a new and highly efficient Spark Tester after a period of 2½ years of development and field testing.

Made for high potential or low voltage.

Supplied with or without stand and with any size electrode desired.

Federal Model CV 15 Spark Tester

Write for Prices and Deliveries

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Federal Manufacturing Co.
SPECIAL WIRE MACHINERY
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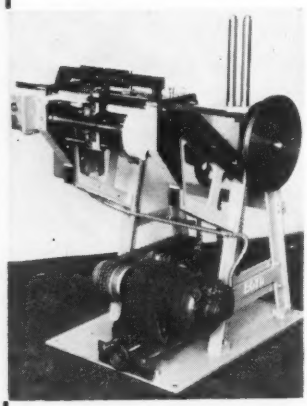
FOR HEAVY DUTY COILING

USE THE NEW BOYD #1200 HEAVY DUTY SPOOLER

Designed for the spooling or coiling of heavy materials on large diameter spools or in coils.



Positive screw reversing mechanism and change gears offer a wide range of distances and speeds for traverse rates to accommodate various sizes of wire or other materials.

Large adjustable slip clutch provides constant speed of winding to allow for build-up and to produce uniformity. This makes this machine an excellent addition to your drawing or finishing machine producing your product at a point where it is to be packaged.

Supplied with gear motor and starter, Hi-Lo pulley and motor base. Can also be had with predetermining counter and auto-stop motion.

Its versatility allows it to be easily suited to meet your particular requirements in spool or coil diameters and traverse widths.

Send for full particulars

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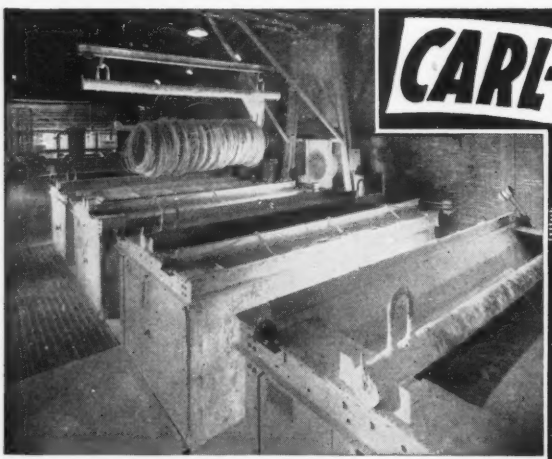

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HI-SPEED REGISTERED

ROD BAKERS

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CANADA
396,144
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GREATER SPEED AND FUEL ECONOMY PROVES OUTSTANDING ENGINEERING

Carl-Mayer Hi-Speed Rod Bakers have an exclusive heating arrangement, combining faster baking with amazing fuel economy—and a patented Blow-Off feature which removes moisture without bumping or agitating the coils. *WRITE FOR BULLETIN NO. 350.*

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Gary Screw & Bolt Division of Pittsburgh Screw & Bolt Corp.
Hollup Corp.
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THE CARL-MAYER CORPORATION

3030 EUCLID AVENUE
CLEVELAND, OHIO

to replace automatic machines on expensive short run production.

★ ★ ★

The new spring winder is ready for operation as soon as it's mounted on a bench or in a vise. Any gauge wire, to ⅛ inch diameter, can be wound into extension, compression, torsion and flat springs. Round, flat, square or rectangular shaped stock can be formed into springs of any length.

★ ★ ★

Inaccuracy in adjusting the tension control each time a spring is wound has been eliminated through the use of a unique tension clamp mechanism. And because of this, it is claimed, duplicate springs can be wound for similar load capacities.

★ ★ ★

Through use of a special camlock device, no time is wasted in trying to thread wire into a difficult holding or locking mechanism, the company says.

★ ★ ★

Cost of this machine is $85.00, complete with six arbors. Delivery approximately 4 weeks. Complete information will be furnished on request.

New Book on Heat Treatment

"Elements of Heat Treatment," published by John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y., offers a simple introduction to the subject, showing how the mechanical properties of metals and alloys may be altered to suit particular situations.

★ ★ ★

Written by the late **George M. Enos** and **William E. Fontaine,** the new book is for such users as mechanical and design engineers, commercial plant personnel, and others who have no need to go into detailed physical metallurgy. It provides, rather, a practical background in metals and alloys, in which their properties are covered, and an explanation given of how they are tested and evaluated. The discussions of the major processes —annealing, hardening, tempering, and normalizing—are treated from

the standpoint of specific jobs that require given characteristics in a metal.

★ ★ ★

Dr. Enos was professor of metallurgical engineering at Purdue University. William E. Fontaine is now professor of mechanical engineering at Purdue. While he was in industry, he did research in high temperature corrosion and made studies of the rupture characteristics of welded and seamless steel tubing at elevated temperatures and pressures

★ ★ ★

"Elements of Heat Treatment" contains 286 pages and is priced at $5.00.

New Flake Aids Forming of Metallic Beryllium

A metallic beryllium flake of high ductile properties is now made available for the first time on a commercial scale by **The Beryllium Corporation,** Reading, Pa.

★ ★ ★

It was introduced as one of the company's new products at the 35th National Metal Exposition and Congress at Cleveland in October.

★ ★ ★

The flake has a minimum purity of 99.5 per cent. Its exclusive feature, however, is its high ductility, which makes it particularly suited to fabricating applications such as hot pressing. The flake's ductile feature is a real aid in the production of metallic beryllium forms and shapes.

★ ★ ★

Among other standard uses, pure beryllium is used for the windows of X-ray tubes and in applications involving nuclear energy.

Data Sheets Issued on Thermistors

Latest information on methods of using Thermistors, heat-sensitive electrical resisters with negative temperature coefficient as well as a description of a new physical demonstration of permanent magnet properties, is available in four technical data sheets, TH-9, TH-10,

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CRITICAL CUSTOMERS

For the past ten years we have specialized in the compounding of Vinyl extrusion and injection molding compounds to specifications, or developing compounds for a specific use.

Underwriters' approved standard compounds are available in all colors for POT, T, TW, 80 Degree C, 90 Degree C and 105 Degree C wires.

Save your plant space for wire processing equipment. Let us tailor your compounds to bring out the special properties you require.

Your inquiries are invited.

ELECTRONIC RUBBER COMPANY

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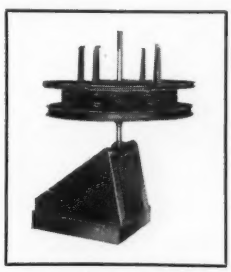
MOSLO "SHIFTWEIGHT"

COUNTER-BALANCED WIRE REELS

Takes the Manual Labor out of loading a Reel with Wire. **Just unlock the knurled spindle by a twist of the wrist, tilt the reel assembly 90°, roll coil of wire to reel, lift 6" on to centering arms, release lock by twist of wrist, use spindle as lever to lift, and the *Weighted Counterbalance does the rest!***



Immediate Delivery
$190.00 F.O.B. Cleveland

Capacity 300 lbs.—Min. Coil I.D. 10"—Max. O.D.—41".
All welded steel construction—Brake Equipped.

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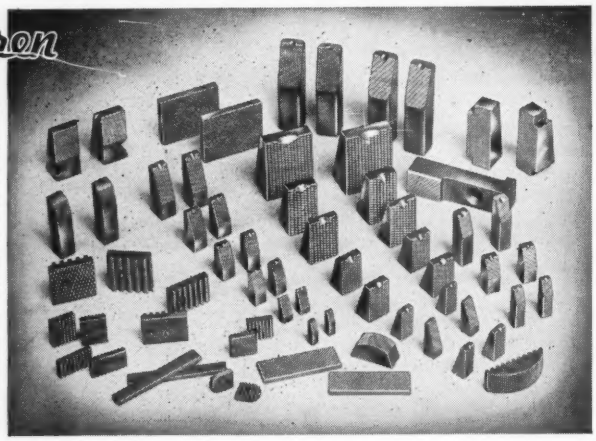
JAWS....

for Wedge Grips, Pullers and Tensile Testing Machines of all makes are available either from stock or manufactured to order. A Sjogren jaw, made to meet your requirements, guarantees you service.



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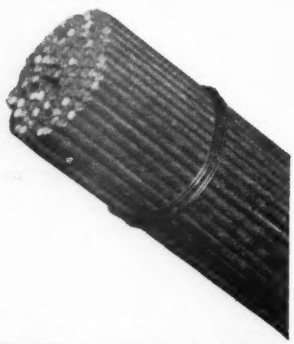
CALWICO

STRAIGHTENED AND CUT WIRE

Applicable to a wide variety of end uses, CALWICO Straightened and Cut Wire is your best buy. For complete information mail the coupon below.



The Colorado Fuel and Iron Corporation
Pacific Coast Division
1080 19th Avenue
Oakland 4, California

Please send data on CF&I Straightened and Cut Wire.

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Use_____ General Specifications_____

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THE COLORADO FUEL AND IRON CORPORATION • Denver, Colorado
PACIFIC COAST DIVISION • Oakland, California

CALWICO STRAIGHTENED & CUT WIRE
THE COLORADO FUEL AND IRON CORPORATION CF&I

TH-11, and PM-116 issued by **Carboloy Department of General Electric Company,** Detroit 32, Mich.

★ ★ ★

The reports describe Thermistor applications in radio set surge protection (TH-11) contactless switches in over-load protective devices (TH-11) temperature compensation (TH-10) warning signals (TH-9) and controlled automation (TH-9). They each include manufacturing, operating, selection and engineering assistance data.

★ ★ ★

The report on magnetic principles (PM-116) discusses magnetic suspension, torque control, driving and braking with permanent magnets.

New Bulletin on Acid-Proof Coating

Electro Chemical Engineering & Manufacturing Co., Emmaus, Pa., has issued a new technical bulletin covering their DURO-KOTE and DURO-KOTE #57 acid-proof coatings. These materials provide the highest type of vinyl and butadiene styrene acid-proof resin protection against acids, alkalies, and many solvent actions respectively.

★ ★ ★

DURO-KOTE and DURO-KOTE #57 are planned primarily as acid-proof and alkali-proof maintenance paints useful in metal finishing, chemical, synthetic fiber, textile dye, metallurgical, electro metallurgical and other plants using corrosive acids.

★ ★ ★

For a copy, please write for Bulletin DK-1-53.

New Cut-Off Wheel Announced

Norton Company of Worcester, Mass., announces an improved reinforced, resinoid, hub-type cut-off wheel. Known as the BFR wheel, this wheel replaces one with the same designation which has been on the market.

★ ★ ★

Longer life is the main feature

of the improved wheel. Tests show that increased life of up to a third more than the former wheel can be expected with the same quality of cut. These more durable wheels also tend toward a better uniformity in grinding action wheel to wheel and lot to lot The improved BFR wheel shows practically no tendency to fray or split at the face in layers.

Two New Books Give X-Ray Analysis Data

Two new books recently published as part of the Philips Technical Library are available at $2.00 each from the Research & Control Instruments Division, North American Philips Company, Inc., 750 South Fulton Avenue, Mount Vernon, N. Y.

★ ★ ★

Titled "Data for X-ray Analysis," Volume I (100 pages), by W. Parrish and B. W. Irwin, contains charts for solution of Bragg's equation. Charts cover K Radiation for molybdenum, copper, cobalt, iron and chromium. Also included is a table that converts minutes into decimals of a degree.

★ ★ ★

Lundahl Moves Plant to Winsted

The Lundahl Corporation recently removed its manufacturing equipment from Hartford, Conn., to its own building in Winsted, Conn., at Sterling Place. At the new location there will be more space both for manufacturing and warehousing, enabling the company to fill orders promptly from stock.

★ ★ ★

In addition to its regular line of spring forming tools and baking ovens, the company has added portable grinding tool and a hardness tester.

★ ★ ★

Administrative and sales offices remain in Hartford at 846 Farmington Ave., West Hartford 7, Conn.

High Quality

COPPER and BRONZE WIRE

Bunched Strand and

Concentric Strand

Spencer wire corporation

555 LEHIGH AVENUE, UNION, N. J.

Plants at Union, N.J., Hillside, N.J., West Brookfield, Mass.

NORBIDE® Abrasive

Write for Catalog No. 559-W

NORTON COMPANY

Worcester 6, Mass.

In the cutting and polishing of wire drawing dies, sizes 220 and 240 are used for ripping, and 320F for semi-polishing. Norbide Abrasive costs 1/100th to 1/150th as much as diamond powder and therefore does not have to be applied so sparingly.

NORTON® *Making better products to make other products better*

Investigate the complete line of world-famed Apco Mossberg Steel Reels, Spools and Bobbins today! Profit from a half-century of Apco experience and technical skill in providing copper wire, steel wire and wire rope manufacturers with the best in steel reels, spools and bobbins . . . in all sizes and shapes . . . for every application. Write today for complete details . . . get your free copy of the Apco Mossberg Steel Reel Booklet.

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APCO MOSSBERG CO.

(The original Frank Mossberg Co.)
ATTLEBORO, MASS.

Important New Alloy Added to Beryllium—Copper Group

A new alloy—Beryldur—having outstanding possibilities in the field of copper base materials was announced at the Metal Show in Cleveland by **The Beryllium Corporation,** Reading, Pa.

* * *

Beryldur is a one percent beryllium-copper alloy whose potentialities are only beginning to be explored. The Beryllium Corporation reports that revolutionary changes in design engineering already have been achieved by using this latest addition to the beryllium-copper family.

* * *

Beryldur may be described as filling the gap of property ranges existing between the two basic groups of beryllium-copper alloys; the high strength and the high conductivity groups. What it does is combine features of both, uniting high strength and hardness values with extraordinary toughness and good electrical conductivity.

* * *

This total combination is unique, and properties may also be varied at will by a simple heat treatment that is nearly fool-proof, the new alloy being capable of working and moderate shaping after mill-harding.

* * *

Matthew J. Donachie, president of The Beryllium Corporation and metallurgist long associated with beryllium-copper, was responsible for a good deal of the research connected with Beryldur. He said the alloy, now being produced on a commercial scale, will play an important role in the field of materials engineering and serve in many new applications not covered adequately by other metals and alloys now in use. Beryldur is viewed, for one example, as a potential rival of bronzes and brasses.

* * *

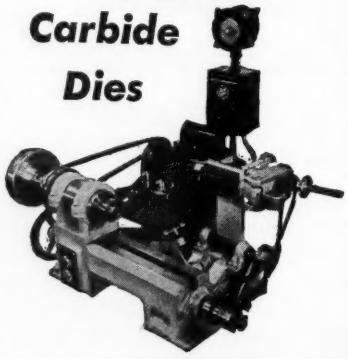
Important applications of Beryldur are predicted for the electromechanical field, especially in the

New

DYKREX

Finishing and Polishing Machines

SAVE up to 50%* on Labor Costs for Finishing Tungsten Carbide Dies

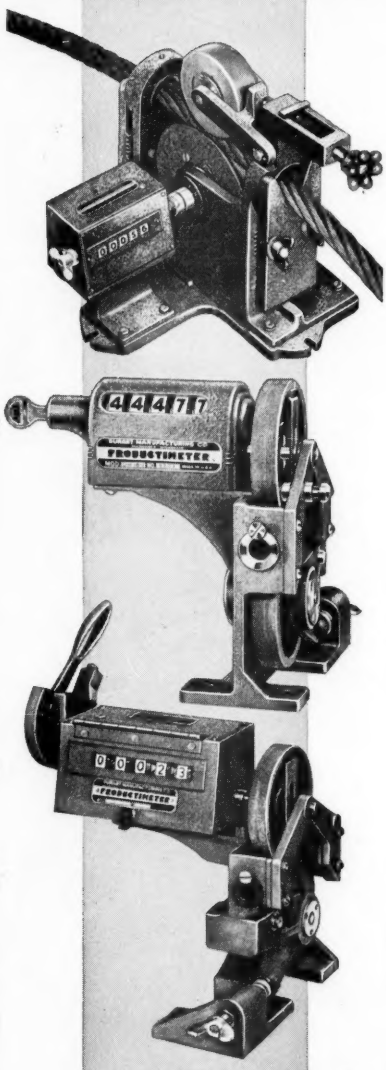


* Statement from actual user by one of America's largest Tungsten Carbide Die Makers.

DYKREX
"IT CORRECTS THE DIE"

Write for full information
ROOS TOOL & MFG. DIVISION
DYKREX CORPORATION OF AMERICA
33-35 Bloomfield Ave., Newark 4, N. J.

PRODUCTIMETER
WIRE MEASURING MACHINES
Fast . . Accurate . . Dependable . . Legible



Productimeters measure all types of wire from .010 to 1½ inches in diameter . . . at speeds up to 5,000 feet per minute. They eliminate "guess-work". . . insure profitable operation in your plant.

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118 Orange St. Providence 3, R. I.
Representatives in Principal Cities

PRODUCTIMETERS SINCE 1879 *Count Everything*

manufacture of springs and switches.

★ ★ ★

At the present time The Beryllium Corporation is producing the new alloy in strip form only. Beryldur will soon be made, however, as wire and rod.

Handbook on Aluminum Electric Wire

A new handbook describing the uses and properties of aluminum for power and lighting wire has been published by the electrical wire and cable department of **United States Rubber Co.**

★ ★ ★

Contained in the 30-page booklet are eight tables referring to various properties of this wire including insulation, current-carrying capacity, comparison of weights, breaking strength and other characteristics of insulated aluminum conductors.

★ ★ ★

Aluminum, which has long been used as a conductor of electricity in high tension lines, is rapidly gaining significance in the power and lighting field. Its light weight is a distinct advantage, especially in the large cable sizes.

★ ★ ★

Copies of this booklet may be obtained from the electrical wire and cable department, United States Rubber Co., Rockefeller Center, New York 20, N. Y.

"Protective Atmospheres"

This new book, published by **John Wiley and Sons, Inc.,** 440 Fourth Ave., New York 16, N. Y. has been written by **A. G. Hotchkiss** and **H. M. Webber** of the Industrial Heating Department of the **General Electric Company.**

☆ ☆ ☆

It is written to assist persons who supervise manufacturing operations, such as process engineers, plant engineers and metallurgists, to obtain a usable understanding of the various phases of protective atmospheres, so that selections of the best atmospheres for given jobs and desired results may be

SIX ADVANTAGES from just ONE DIP!

COAT WITH BORAX 5 MOL.

Here are the advantages you get when your stock is Borax-coated . . .

1. FASTER ACID NEUTRALIZING
2. LONGER DIE LIFE
3. FASTER BUTT WELDING
4. BETTER WORKING CONDITIONS
5. LONGER STORAGE SAFETY
6. RUST DOES NOT FORM

One dip puts on a Borax coat that is tight, yet pliable, and dries in a few minutes. It provides a good vehicle for your drawing lubricant and won't flake off. Borax-coated rods are a lot cleaner to handle in transit and are protected from rust while in storage. Try BORAX or BORAX 5 MOL on *your* stock!

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BORAX BULLETIN No. 2WD

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NEW YORK • CHICAGO
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PHILADELPHIA

MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS

made. It is not a treatise on equipment design, but emphasizes instead the practical aspects of heat treatment in such manner that it will serve the reader as an operating manual.

★ ★ ★

Tabulations of data showing compositions and costs of typical protective atmospheres are given, with common industrial processes for which the atmospheres are used.

★ ★ ★

The ability to disguise troubles and check them quickly is most important to atmosphere users. Simple tests to determine the causes of discoloration, oxidation and decarburization are set forth, with suggestions as to how to eliminate operational faults that spoil work or delay production.

★ ★ ★

The book is divided into 9 chapters, each devoted to a separate phase of the subject, and contains 341 pages of text. It sells for $7.00 a copy.

Bulletin on Furnace Loading Equipment and Spiders

Lee Wilson Engineering Co., 2005 W. Lake Road, Cleveland 16, Ohio, has issued a bulletin on their new rod and wire coil loading and stripping machine and multi-unit furnace spider.

★ ★ ★

The new equipment, is said to be safer, faster, and more efficient in rod and wire coil handling. From an awkward and time consuming operation, the machine has reduced the loading to one that a single operator can handle, setting an entire coil to be annealed on the furnace base in a matter of seconds. Unloading the furnace is equally fast and simple.

★ ★ ★

The bulletin will be sent upon request to interested persons or concerns.

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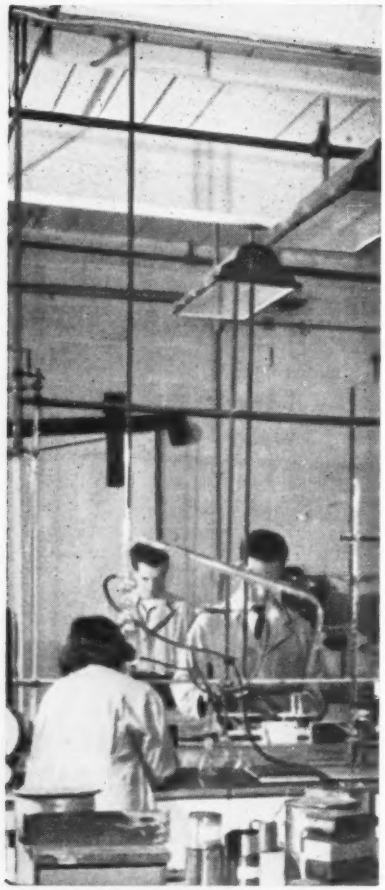

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AT OUR EXPENSE!

Your cable coating problems can only be solved by adequate laboratory research.

Realizing this fact, we regularly allocate six cents out of every sales dollar for lacquer research activities. This progressive research policy enables us to formulate modern, improved coatings designed to meet the newest of present-day specifications.

Are you currently faced with a cable coating problem? If so, we'd appreciate the opportunity to help. Write today!

The above photograph is one of many contained in an eight-page brochure describing our facilities to serve you. Write for your copy of the complete brochure!

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BUNCHING
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IN THE WIRE AND
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PROCESSES

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FACILITIES
AT YOUR SERVICE

Expanding application of twisting principles to the production of many products is reflected by an ever-increasing demand for both H-D standard equipment as well as machines especially engineered to solve varied production problems. Week after week surprising new uses are developed through the close cooperation of our engineering department with manufacturers in many fields.

Write today for our New Technical Bulletins. Tell us what you make—or contemplate making and your inquiry will receive prompt attention.

HASKELL-DAWES
MACHINE CO., INC.
2231 E. ONTARIO ST.
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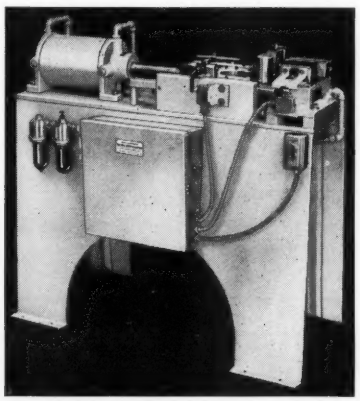
PA.

New Air Operated Cable Stripper

A newly designed speedcraft stripper will handle all sizes of insulated cable — from smaller sizes to the largest cable, removing the toughest insulation regardless of whether the insulation is imbedded into the strands or is free stripping —without damaging or cutting strands.

★ ★ ★

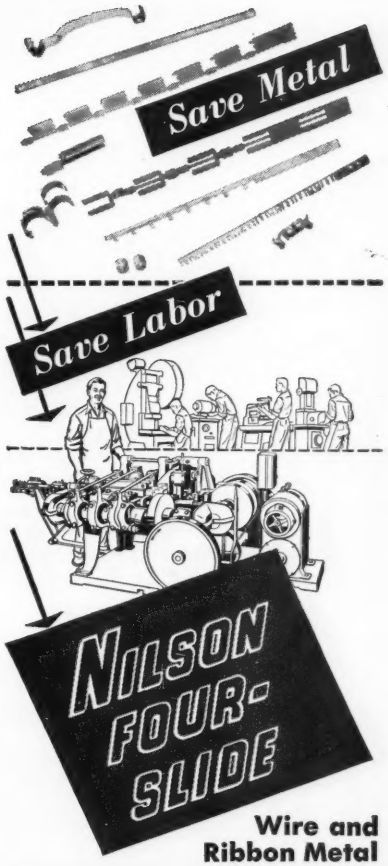
The machine will go through its sequence of operations in less than four seconds and can strip at least six cable ends per minute, including handling.



The operation is entirely automatic. When the cable is inserted into the machine and hits the end stop, a micro switch starts the operation which consists of gripping the cable in a vise, stripping the cable by knives and pulling off the insulation from the end of the wire. On 1½" O.D. cable this took less than four seconds.

★ ★ ★

Adjustments for changes from one size of cable to another is made in a matter of seconds. Two types of operating heads are available depending upon size change requirements. Ruggedly built this Speedcraft Cable Stripper will last many years and give dependable service. The manufacturer, Wire Stripper Co., 1725 Eastham Ave., E. Cleveland, Ohio, will quote on prices and delivery if samples are sent for stripping.



Wire and Ribbon Metal
FORMING MACHINES

Mounting production costs are driving firms out of the competitive picture. Too much scrap metal! Too many single operation machines! Too many operators! This whole picture can be changed to a highly profitable operation.

Install a NILSON combination press and 4-Slide forming machine. This machine takes wire or ribbon metal directly from the coil, straightens, feeds, pierces, blanks, swages, stamps, or coins, cuts off and forms . . . automatically in one quick precise operation. See the new picture? . . . Increased production! Minimum scrap metal! One machine for all operations! One operator!

For specific recommendations . . . send details of your operation.

There's Nothing Like a NILSON

NILSON has been specializing in Forming Equipment for over 50 years.

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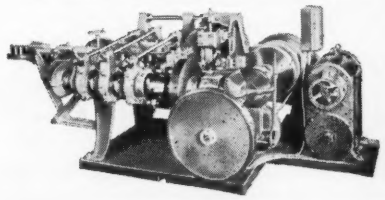
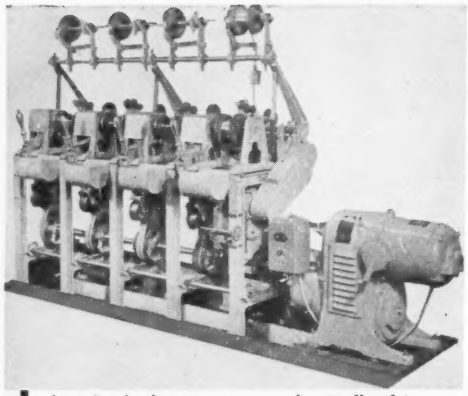
CHICAGO • CLEVELAND • DETROIT •
LOS ANGELES • HAMILTON, ONT., CANADA





1900-HV MULTIPLE SPINDLE SPOOLER

SPECIFICATIONS
Size Range: .010" to .080" or heavier if soft and many flat wire sizes.
Max. Spool Size: 16" flange diameter.
Capacity: usually 4 to 8 spindles.

The 1900-HV Spooler is a rigid, precision machine which will consistently produce a uniform, dense wire lay. Both the traverse and spindle drives are regulated through wide-range, stepless, variable speed units, eliminating change gears. The 1900-HV is completely adaptable to your particular constant or changing demands. All controls are positive. Adjustments are made accurately with the spooler in operation and without tools.

Both smooth acceleration and rapid stopping is obtained through a single lever at each station. Spool changing is simple and rapid. Anti-friction bearings are used on all shafting and spindles.

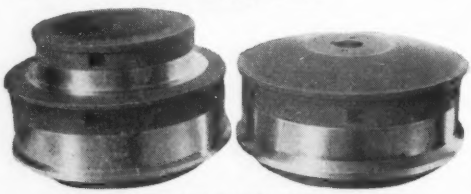
Your special requirements can be incorporated into the design. Each machine is delivered ready for operation from your power supply. Payoff stands furnished as extras.

Consult us on your spooling problems.

ROBERT J. EMORY COMPANY
31 East Runyon Street Newark 5, N. J.

3 TO 10 TIMES LONGER LIFE!
WITH HARDSURFACES

ON YOUR DRAW BLOCKS • DRAW RINGS • CAPSTANS • PULL BLOCKS • SHEAVES • TABLE ROLLS • SHEAR BLADES • CRANE WHEELS • SHAFTING and other WEAR SURFACES.



HARDSURFACED VAUGHN HR BLOCKS

When your equipment hardsurfaced with our special alloys, you— SAVE ON DOWN-TIME and WIRE REJECTIONS and INCREASE YOUR WIRE PRODUCTION.

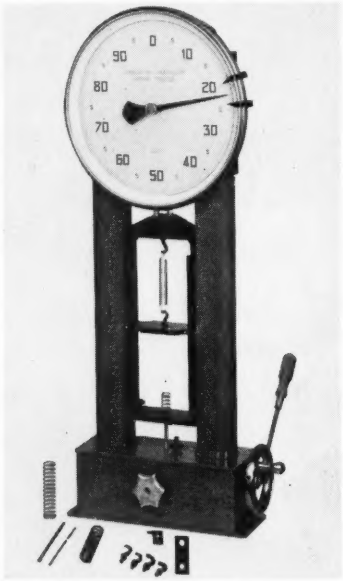
In an Eastern Wire Mill, standard cast iron or mehanite blocks, pictured above, which previously gave 6 *months* service before refinishing, now last 5 *years* before regrinds when hardsurfaced by us. The ⅛" deposit of hard metal will be reground several times before rewelding with hardsurfacing. Block diameter size is maintained within ¼" at all times. Original parts will be used over and over again.

Get the facts today.

PARKWAY-KEW CORPORATION
P. O. Box 504 Menlo Park, N. J.
Tel.: Metuchen 6-4747

Spring Tester of 100 Lb. Capacity

This new spring testing instrument tests loads and deflections of medium size compression and extension springs and has a capacity up to 100 lbs. The large 15" diameter dial is easily read and meets the National Bureau of Standards Requirements for accuracy of ¼ of 1%. This instrument is adaptable for both general purpose and high quantity production testing and has been used at the production rate of 400 to 600 tests per



hour. Springs with diameters up to 4" and lengths to 12" can be tested. Steel rules measuring lengths in 32nds and 64ths on one side also measure lengths in decimals on the reverse side. A descriptive bulletin is available from THE CARLSON COMPANY, 277 Broadway, New York 7, N. Y. Phone BArclay 7-2552.

THE WIRE ASSOCIATION
invites wire men to join the organization and participate in its activities.

Write for a booklet on what it is and how it functions to

RICHARD E. BROWN
Executive Secretary
453 Main Street Stamford, Conn.

7 out of 9

WIRE MILLS

that Liquor Finish Wire

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STANNOUS SULFATE

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Tin Losses Are Reduced . . .
by elimination of high tin sludging due to incomplete reaction in feather tin method.

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only two variables to watch — Stannous Sulphate and Copper Sulphate — allows immediate, simple color adjustment.

Every Batch the Same . . .
M&T Stannous Sulphate method produces smooth, uniform wire coatings, unvarying from lot to lot.

See how use of M&T Stannous Sulphate can help you save tin in liquor finishing. Write for engineering data.

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100 E. 42nd St., New York 17, N. Y.
Specialists in Tin and Tin Chemicals

NOTICE TO OUR SUBSCRIBERS

FOR THE FIRST TIME IN OUR HISTORY we are obliged to increase our subscription rates to Wire and Wire Products. Steadily rising costs for printing, engravings and postage necessitate this step, which we regret to have to announce.

* * *

SECOND class postal rates have already risen 32% and by mid-1954 they will be 62% over those of 1952.

* * *

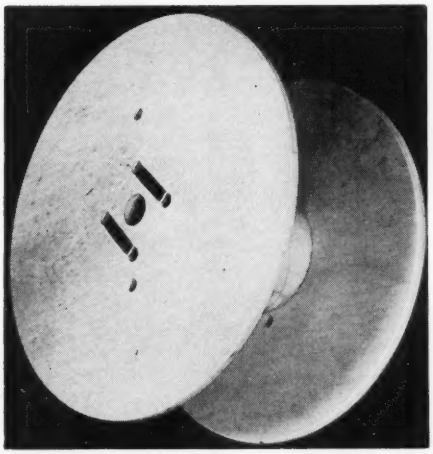
HENCE, beginning January 1, 1954, the new subscription rates will be $8.00 for our domestic and Canadian readers and $10.50 for those abroad. Single copies will cost 75¢ each, except for October and January, the price of which will be advanced to $1.25.

* * *

EVEN at these new rates, we shall be obliged to absorb some of the expense of mailing, as at the present time it costs us $11.00 to fill a domestic subscription for 1 year and correspondingly more for our foreign subscriptions.

FINE PLYWOOD REELS

FOR WIRE



Made of air-dried wood, all parts secured with metal strapping. This reel is durable and strong. Heads cannot be dislodged by heavy side load pressures.

Reels shipped knocked down or assembled — metal strapping easily applied by standard metal fastening clips used for boxes, etc.

Heads have accurately fitted dovetail joints that give the reel extreme rigidity. Returnable and non-returnable types, made in head diameters of 6 in. to 22 in.

Shipped to any point in New England by truck
Get the facts on these fine reels

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Our Products Carry Reel Loads.

Top quality non-returnable spools . . . available in standard head and barrel sizes.

Write for a quotation today!

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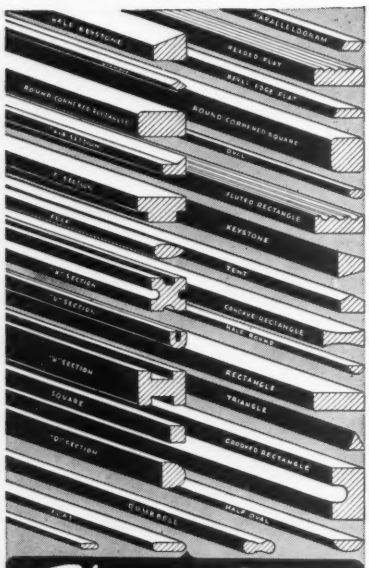


Shaped Wire
TO YOUR "SPECS"
High- and Low-Carbon Steel and Non-Ferrous Wire . . . shaped to your exact specifications.
CHARTER WIRE, INC.
MILWAUKEE
Phone BRoadway 6-1329
635 E. Polk Street, Milwaukee 2, Wisconsin

Celanese Completing New Pilot Plant for Plastics

Construction is nearing completion on a new pilot plant center of the Plastics Division of **Celanese Corporation of America** as an addition to the present facilities of the Summit, New Jersey, Research Laboratories. The construction reflects Company emphasis on expansion in the synthetic resin and polymer field.

★ ★ ★

Plans include the construction of a 50 by 100 foot open concrete slab and a tall 50 by 50 foot building. The slab will be used for the outdoor erection of "closed-system" continuous pilot units. The building will house those units which must be enclosed as well as control panels for the outdoor pilot plants. Building and slab construction will each stress ease of expansion to meet future needs.

★ ★ ★

The pilot plants will provide equipment for the program of the Process Engineering Section. The company plans to build experimental units for process and production research involving current Celanese plastics, such as polyesters, and new polymers.

Copperweld Steel Promotes Heidish

The Wire and Cable Division of **Copperweld Steel Company,** Glassport, Pa., announces the promotion of **J. A. Heidish** to Assistant Manager of Production. His previous assignment was Superintendent of the Casting Department. During his 23 years with Copperweld, he also served as Metallurgist and Assistant Chief Metallurgist.

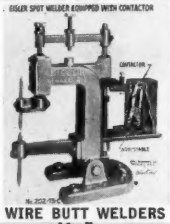
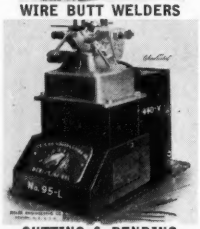
★ ★ ★

In 1929, Mr. Heidish graduated with a B.A. degree from Colgate University. A year later, he received a Master's degree from Carnegie Institute of Technology.

Talon Opens Southern Plant

Talon Inc., Meadville, Pa., recently dedicated its newest plant, located in Cleveland, Ga. The manager of the new plant will be **Lewis R. Cooper.**

For FINE WIRES from .001" to 1/16"
High Speed Wire Cutters and Benders. Wire Spot Welders and Wire Butt Welders. Ask for test samples. Established 1920.

FINE WIRE SPOT WELDERS

WIRE BUTT WELDERS

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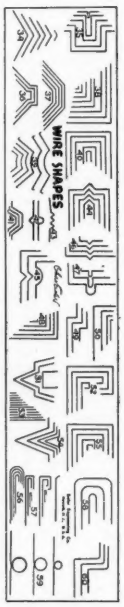

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Made in 12" to 24" diameters.

No nails used. *All glued construction.* Made of kiln-dried wood. Special design prevents breaking or splintering of wood, protecting insulated wire from damage.

Write for details

WILLIAM McCASKIE, INC.
FORGE ROAD • WESTPORT • MASS.
Tel.: 145 Est. 1903

Rod and Wire Quality vs. Cold Heading Quality

(*Continued from page* 1293)

duce a head within diameter tolerances. In either case, when this occurs, there will be head out-of-roundness.

Rough-Surfaced Bolts

Occasionally, there develops a rough-surfaced bolt which does not require trimming.

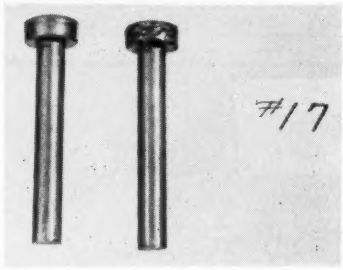

Fig. 17 * * * * * * * * * * * * * * *

Figure 17 shows two Fillister Head Screws—one is the smooth finish as required, and the other shows a rough surface. The rough surface was caused by either a "rolled-in-scale" condition or a "checked surface on the rod"—a defective material condition.

★ ★ ★

Occasionally, a similar condition will be caused by the "orange-peel effect" (extremely large grain size) developed during the annealing cycle of the wire—a defective manufacturing condition.

Off-Patterns and Piped Steel

Figure 18 shows "split" lag screw threads. This was defective material—"piped" steel. The pressure of roll-threading is so great that any slightly "piped" material will immediately "open up" as shown. This is particularly true with any gimlet point work, as the depth of thread is cold-formed approximately 1/3 down and 2/3 up from the blank diameter.

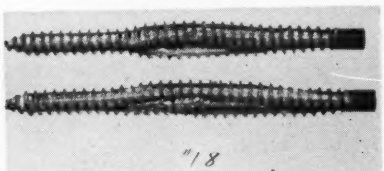

Fig. 18 * * * * * * * * * * * * * * *

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Up to the finest mesh in bronze and stainless steel.

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MUSIC WIRE and SPECIAL WIRES

Music Wire for Industrial Purposes
211 sizes Bright Polished, .0015" to .3125"
45 sizes Bright Tinned, .003" to .125"
Aluminum—Annealed—Belt Lacing—Brass, Soft and Spring—Copper, Bare and Tinned
Coppered Steel Spring—Galvanized—Tinned
Monel—Nickel Silver—Pure Soft Nickel—Oil Tempered, Steel Spring, Black Finish
Phosphor Bronze, Spring Temper—Pure Iron Wire—Resistance Wire,
Hoskins Chromel "A"—Stainless, Soft and Spring Temper—Tag Wire, 1000
in an Envelope—Florist Wire—Spooled and Coiled, 1/4-1/2-1-5#
Wires Straightened and Cut to length—Small Gauges—Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
Leader Wires, "Wilstabrite" Stainless and "Silverbrite" Music.

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Prompt Shipments on Large or Small Orders

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CARRIS REELS, INC.

"The Reel with the Plywood Barrel"

RUTLAND **VERMONT**

A defective manufacturing method can be warped dies which would produce a similarly defective product. Warpage in the center section of the dies causes more extreme pressure in the center area of the threaded section and will cause the blank to split during threading.

★ ★ ★

Figure 19 shows some split machine screw and unified threaded products. The defect is caused by "piped" steel. The roll-threading pressure is not as great on this product as on the lag bolts because the ratio of thread depth is only about 50% down and 50% up from the blank diameter. Moreover, the thread depth is not as extreme.

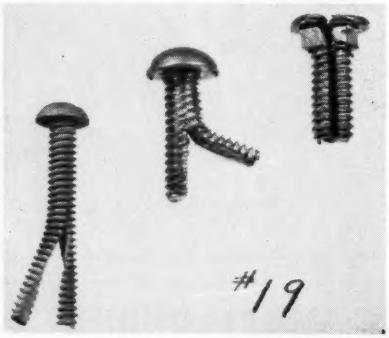

Fig. 19

On the smaller diameter work, much of the material will not split open as shown in Figure 20, but will show a fine crack or seam on the thread, which, in turn, will not gauge properly. Cost-wise, it is impractical to sort when this last condition arises, and all product must be scrapped.

★ ★ ★

Figure 20 illustrates one example of what "off-patterns" will do. Also shown is the pattern of wire. The shavings on the threads were caused by the rim of the steel breaking away from the core during thread rolling. Definitely, any patterns of this nature are detri-

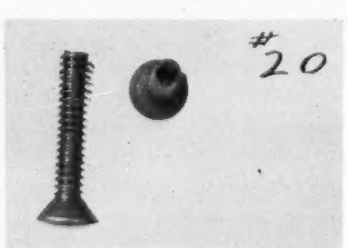

Fig. 20

mental to cold-headed products.

★ ★ ★

A similar condition can be caused by mismated or misaligned roll threading dies; however, this seldom occurs during manufacturing.

★ ★ ★

It is hoped that these few illustrations will help you, as the rod and wire producers, to recognize the value of the quality of your product and the effect of your quality on ours.

Continuous Annealing with Carbon Restoration of Coils & Bars

(*Continued from page* 1309)

burizing, and restoring carbon to the decarburized surface of bars and wire has been a very interesting problem. It has also proven quite profitable, not only from the annealing standpoint but also by reducing pickling and cold drawing costs and eliminating the necessity of scale breaking.

★ ★ ★

We do not consider this development finished. The work we have done with furnace atmospheres so far has opened up other avenues which may lead to the development of other useful products.

★ ★ ★

I will close on the same note with which I opened this talk—you can't learn to swim unless you get into the water. If you have a sound idea and the proper training to back it up, don't wait until you have solved every detail before you try out the idea. Start putting the idea to work and observe the results. Then follow the path wherever it may lead and the chances are you will wind up with something worth while, even though it may not be exactly the thing you started out to do.

★ ★ ★

Cheerfulness lubricates the axles of the world-great numbers of people go through life with a continuous squeak.

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Round for Kel-F & Teflon Insulated Radio and Instrument Hook-up Wire and UHF Cables.
Flat for Tinsel Ribbons and Tinsel Garlands.
— also —
Bare Electric Tinsel Conductors for Telephone-Razor-Hearing Aid Cords.
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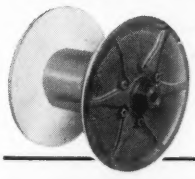

Having trouble with light weight reels failing in heavy duty service? Send us a sketch or print stating the limiting dimensions and service required, we'll be glad to tell you about our facilities for supplying the wire rope and cable industry with special heavy duty processing reels, spools or bobbins. WRITE FOR BULLETIN 52-W.

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THE BETTER YOUR WIRE . . . THE BETTER YOUR PRODUCT!

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Fine products are made from fine-quality materials. That's why so many fabricators and formers select Cortland Brand specialized low carbon wires. Cortland Brand wires are among the finest available . . . made from the best corrosion-resisting, open-hearth steel in Wickwire's own mills. Use them for your products . . . in any of the following types, sizes and finishes.

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SIZE: coils, spools or straightened cut to length.
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To our many friends in

THE WIRE INDUSTRY

who have favored us with their business during the past year, we extend our

Christmas Greetings

and best wishes for a

Prosperous New Year

Your patronage of our services in the reclamation of used diamond powders is greatly appreciated and we shall endeavor to deserve your continued confidence in the coming year.

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WIRE DRAWING

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Sales Office
Philadelphia—Pittsburgh—New York

Personalities

(*Continued from page* 1331)

rolling gold and silver into plate and followed along with foot and screw presses. Mr. Mossberg's machines greatly advanced plating work.

★ ★ ★

His study of rolling mills in the jewelry industry led to his invention of the roller bearing. Until 1890 only ball bearings had been used.

★ ★ ★

Although Mr. Mossberg was handicapped by lack of knowledge of the English language when he came here, he had one valuable asset, he had already been educated in Sweden as a machinist and draftsman.

★ ★ ★

Gaining a degree of success Mr. Mossberg enlarged his shop and later incorporated. When Mr. Mossberg made a trip to Europe to sell some goods, on his return he found his associate had made personal sales during his absence, creating debts and trouble.

★ ★ ★

He then formed the Mossberg Wrench Company, now the Apco-Mossberg plant. Then came the founding of the Mossberg Pressed Steel.

★ ★ ★

During World War 1, Mr. Mossberg traveled widely as consultant for new factories engaged in the war effort and it was after release from this work that the Pressed Steel plant was started in 1919.

★ ★ ★

Mr. Mossberg above all was noted as an inventor. The U. S. Patent office at Washington lists more than 200 of his inventions and many others are recorded in Stockholm, London, Berlin, Paris, Copenhagen and other European capitals.

Harold B. Thomas

Harold B. Thomas, founder of the **Elastic Stop Nut Corporation,** died in October in Orange Memorial Hospital. He was 62.

Long Life...free from Corrosion

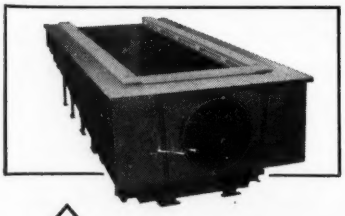
HAVEG Pickling Tanks

There is no substitute for genuine Haveg tanks with their superior resistance to corrosion and permanent freedom from contamination.

HAVEG is a moldable, thermosetting plastic made of asbestos and resins selected for specific service with various corrosives. It is not a lining or coating . . . but is a solid corrosion-resistant material through and through.

As you increase the speed and output of pickling, the need for Haveg tanks, perforated pipe, pumps, pipe and valves increases. Act now.

Write for 64-page Bulletin F-6 with tank sizes, method of construction, chemical ratings.



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Style A:
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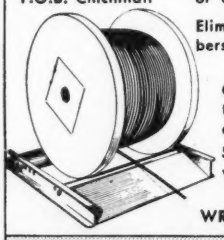
F.O.B. Cincinnati

Low slanted front and positive front lock insure quick loading or unloading.

Eliminate jacks, cumbersome handling.



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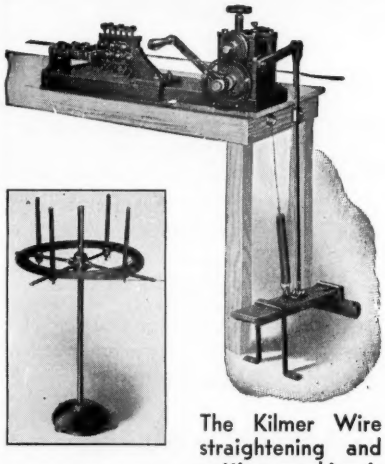

The Kilmer Wire straightening and cutting machine is hand operated and recommended for wire No. 8 to No. 19 gauge.
Wire Reel will handle coils up to 150 lbs. with I.D. adjustments from 7" to 22" and 30" O.D.

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Born in Crafton, Pa., he served as vice president in charge of sales of Elastic Stop Nut until 1940 when he resigned to enter consulting work in industrial product analysis. He was elected chairman of the board of the Norma Hoffman Bearings Company of Stamford, Conn. in 1948. He left that position several months ago.

★ ★ ★

At his death, he was president of Control Products, Inc., of Harrison and the Burgess Thomas Company of Bloomfield and treasurer of the Calculagraph Company of Harrison.

Elected to Presidency of Federal Screw Works

B. L. Norton, formerly vice president and treasurer of the **Federal Screw Works** in Detroit, has been elevated to the company's presidency, it was announced by **W. T. ZurSchmiede,** executive committee chairman. Mr. Norton succeeds **W. T. Stewart,** who has been named board chairman. Mr. Norton will retain his duties as treasurer.

Stuart R. Booker was elected executive vice president, and three new vice presidents were named. They are: **R. R. Bever,** in charge of sales; **R. I. Stanton,** in charge of manufacturing; and **Lawton J. Steger,** in charge of scheduling and planning in the company's Chelsea (Mich.) division.

Elected Treasurer of Maryland Fine and Specialty Wire

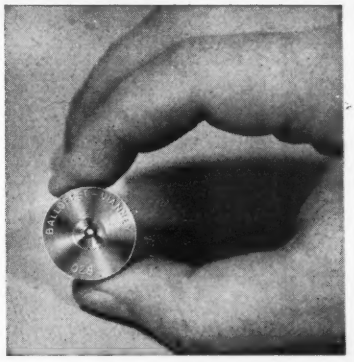
George E. Seeley, who has been Works Manager and Assistant to President **L. C. Crewe, Jr.** of the **Maryland Fine and Specialty Wire Company,** Cockeysville, Md., was recently elected Treasurer of the company.

★ ★ ★

Mr. Seeley, who has had 14 years of experience in the wire industry, is a graduate of the Baltimore City College and of the University of Maryland, from which latter he secured a degree of B.S. in Mechanical Engineering.

★ ★ ★

BALLOFFET VIANNEY WIRE DIE CO., Inc.



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Manufacturers of Quality diamond dies since 1870

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Precision-made carbide tools, any type, made to your order.

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Quality in Diamonds + Perfection in Workmanship = Good Wire.

Satisfactory DIAMOND DIES can only be made by those who have experience, skill and knowledge. WAYNE has all of these. Users have called WAYNE DIES "the best."

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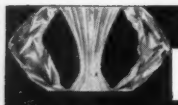

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Seymour to Manage New Wire Mill in Puerto Rico

A new concern, headed by **C. G. Raible** of Cleveland, was organized earlier this year to construct and operate a wire mill under the industrial development program sponsored by the Insular Government.

★ ★ ★

The company is the **Gulf Steel and Wire Company.** Its plant, now under construction, is situated near the town of Bayamon, about 10 miles from San Juan. **Leroy D. Seymour** is supervising the work and will manage the business, which is expected to be in full operation by March 1, 1954.

★ ★ ★

Located on a 16 arce plot of land, the first building will be 180 x 320 feet and have a capacity of 40,000 tons, of finished wire products per year. The principal products will be chain, nails, concrete mesh, chain line fencing and galvanized wire.

★ ★ ★

Jack reports that he is enjoying the work and will be happy to hear from his friends—or see them if they would like to visit the country. The company address is: 211 Medical Arts Bldg., Stop 3½, San Juan, Puerto Rico.

Fastener Executive Appointed

E. L. Argo has been appointed assistant to manager of sales of the Bolt Products Division of the **Sheffield Steel Corporation,** Kansas City, Mo.

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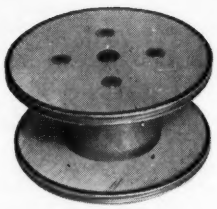

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WOOD REELS and SPOOLS
AMERICAN WOODWORKING COMPANY
1" to 60" Diameters
OVER 50 YEARS EXPERIENCE
1674 No. Lowell Avenue
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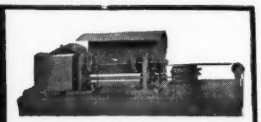

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A Review of Recent Wire Patents

(*Continued from page* 1333)

ern Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The machine is adapted to winding wires on toroidal cores through various arcuate portions thereof and with various spacings of the wire strand.

No. 2,656,283, METHOD OF PLATING WIRE, patented October 20, 1953, by Albert O. Fink and Alfred E. Bishop, Dayton, Ohio, assignors to The Commonwealth Engineering Company of Ohio, Dayton, Ohio, a corporation of Ohio.

Wire plating, according to this patent, is carried out by running the wire through a tubular unit of relatively small diameter partitioned into segments or compartments.

No. 2,656,859, STOCK FEED MECHANISM, patented October 27, 1953, by William B. Retz, Plainville, Conn., assignor to The New Britain Machine Company, New Britain, Conn., a corporation of Connecticut.

There are twenty-one claims to this wire feeding apparatus.

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Dowling Elected Vice-President of Tensolite

C. H. Minich, President of **Tensolite Insulated Wire Company, Inc.** announces the election of **J. J. Dowling** as Vice-President of the company at a recent meeting of the Tensolite Board of Directors.

★ ★ ★

Mr. Minich states that Mr. Dowling will continue in his capacity as General Manager of the company.

★ ★ ★

The Tensolite Company is a leading manufacturer of miniature wire and cable for the electronic and electrical industries. General offices and plant are located in Tarrytown, New York.

Celanese Appointments

C. M. Reynolds has been named assistant director of sales of the film department, Plastics Division, **Celanese Corporation of America.** Previously, he was assistant district manager of the Midwest sales territory. **Peter J. Dunn** replaces Mr. Reynolds in the latter post.

★ ★ ★

At the same time it was announced that **Loring E. Harkness, Jr.** was appointed Chief Industrial Engineer of the Plastics Division. The department will be engaged in co-ordinating efforts to improve the efficiency of the manufacturing operation of the plastics plants.

★ ★ ★

Mr. Harkness, recently with Dan River Mills Inc., was also associated with Aluminum Company of America for many years.

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DIES—Special Shapes, Etc.
Continental Carbide Die Co., Lyndhurst, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit.
Continental Carbide Die Co., Lyndhurst, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS & TRAVERSES—Flange Steel
Entwistle, Jas. L. Co., Providence, R. I.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

DRYING EQUIPMENT
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Metal Fatigue—Fatigue of Materials Laboratory, Princeton, N. J.
Wire Insulating and Rubber and Plastics Processing—Hale and Kullgren, Inc., Akron, Ohio
Zinc—Imhoff, Wallace G., Co., No. Highlands, Calif.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Harper Electric Furnace Corp., Buffalo, N. Y.
Rockwell, W. S. Co., Fairfield, Conn.
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Holden, A. F. Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Holden, A. F., Co., The, Detroit, Mich.
Morrison, John R., Industries, Inc., Cleveland, Ohio
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Trauwood Engr. Co., Cleveland, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.
Holden, A. F., Co., The, Detroit, Mich.
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

GUIDES—for Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOOKS—Pickling & Liming
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

IMPREGNATING MATERIALS—
Solar Compounds Corporation, Linden, N. J.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Belding Heminway, New York, N. Y.
Celanese Corporation of America, New York, N. Y.
Electronic Rubber Co., Stamford, Conn.
Glass Fibers, Inc., Toledo, Ohio
Heineman Corp., Oscar, Chicago, Ill.
Merrimac Paper Co., New York, N. Y.
Naugatuck Chemical Division of United States Rubber, Naugatuck, Conn.
New England Lacquer Co., E. Providence, R. I.
Solar Compounds Corporation, Linden, N. J.
Solar Varnish Corp., Linden, N. J.

INSULATING MATERIALS — Paper—For Electric Wire Cable
Merrimac Paper Co., New York, N. Y.
Solar Compounds Corporation, Linden, N. J.
Solar Varnish Corp., Linden, N. J.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.
Solar Compounds Corporation, Linden, N. J.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

LUMBER—Wire Mill, Carload shipments for lagging and car blocking
Canada Reels, Ltd., Bury, Que., Canada
North Anson Reel Co., No. Anson, Me.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wean Engineering Co., Cleveland, Ohio

MACHINERY—Bolts & Rivets
Meyer, Roth & Pastor Maschinenfabrik (Cosa Corporation, New York, N. Y.), Koln-Raderberg, Germany

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Wardwell Braiding Mach. Co., Central Falls, R.I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Chain Making
Meyer, Roth & Pastor Maschinenfabrik (Cosa Corporation, New York, N. Y.), Koln-Raderberg, Germany
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Closing Rope
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh.
American Insulating Mach'y Co., Phila., Pa.
Hale and Kullgren, Inc., Akron, Ohio
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.

MACHINERY—Diameter Testing Continuous
Standard Electronic Research Corp., New York, N. Y.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Kelly Wire Die Corp., New York, N. Y.
Nord International Corp., Denville, N. J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Dry Blending Plastics
Robinson Manufacturing Co., New York, N. Y.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio

MACHINERY—Extruding
Aetna-Standard Engineering Co., Pittsburgh.
Davis-Standard Sales Corp., Mystic, Conn.
Hale and Kullgren, Inc., Akron, Ohio
National Rubber Machinery Co., Akron, Ohio
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Malmedie Maschinenfabrik, Dusseldorf, Germany
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp. Cleveland, Ohio

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Lendt & Co., Inc., New York, N. Y.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Ets. Pourtier Frères, Romainville, France
Fidelity Machine Co., Inc., Philadelphia, Pa.
Hale and Kullgren, Inc., Akron, Ohio
National Rubber Machinery Co., Akron, Ohio
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Mach. Co., Central Falls, R.I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Industrial Ovens, Inc., Cleveland, O.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Providence, R. I.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The, Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
Meyer, Roth & Pastor Maschinenfabrik (Cosa Corporation, New York, N. Y.), Koln-Raderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Eng'g. Co., Youngstown, Ohio

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.

MACHINERY—Pointing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Hale and Kullgren, Inc., Akron, Ohio
Meyer, Roth & Pastor Maschinenfabrik (Cosa

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Corporation, New York, N. Y.), Koln-Raderberg, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.
Malmedie Maschinenfabrik, Dusseldorf, Germany
Wean Equipment Corp., Cleveland, O.

MACHINERY—Pre-Heater for Wire (for Extrusion of Plastics)
Industrial Ovens, Inc., Cleveland, Ohio
National Rubber Machinery Co., Akron, Ohio

MACHINERY—Re-Spoolers
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Davis Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Providence, R. I.
National Mach'y Exch. (Used), New York, N. Y.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Engineering Co., Cleveland, Ohio

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
National Rubber Machinery Co., Akron, Ohio
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Providence, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
Carlson Company, The, New York, N. Y.
Lendt & Co., Inc., New York, N. Y.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany.

MACHINERY—Straightening & Cutting
Kilmer, M. D., & Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Medart Co., The, St. Louis, Mo.
Mettler Machine Tool Co., New Haven, Conn.
Meyer, Roth & Pastor Maschinenfabrik (Cosa Corporation, New York, N. Y.), Koln-Raderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Hughesville Machine & Tool Co., Hughesville, Pa.
Maillefer S. A., Renens-Lausanne, Switzerland.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Robinson Manufacturing Co., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Hale & Kullgren, Inc., Akron, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Marshall-Richards Machine Co., Ltd., Crook, County Durham, England
Robinson Manufacturing Co., New York, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Ets. Pourtier Frères, Romainville, France
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Hale & Kullgren, Inc., Akron, Ohio
Marshall-Richards Machine Co., Ltd., Crook, County Durham, England
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding (See WELDERS—Butt and Spot)

MACHINERY—Winding Wire
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L., Co., Providence, R. I.
Federal Manufacturing Co., Wallingford, Conn.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Hale & Kullgren, Inc., Akron, Ohio
Herborn, Herborn, Germany
Marshall-Richards Machine Co., Ltd., Crook, County Durham, England
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
Kilmer, M. D., & Co., Cleveland, Ohio
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Angier Corporation, The, Framingham, Mass.
Lendt & Co., Inc., New York, N. Y.
Marshall-Richards Machine Co., Ltd., Crook, County Durham, England
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Wean Equipment Co., Cleveland, Ohio

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio
Morrison, John R., Industries, Inc., Cleveland, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio
Morrison, John R., Industries, Inc., Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Morrison, John R., Industries, Inc., Cleveland, Ohio

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio
Nukem Products Corporation, Buffalo, N. Y.

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.
Solar Compounds Corp., Linden, N. J.

PAPER—Creped Wrapping
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS — (See COMPOUNDS — Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio
Nukem Products Corporation, Buffalo, N. Y.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICS—for Wire Insulation
Naugatuck Chemical Division of United States Rubber, Naugatuck, Conn.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

PRESSES—Hydraulic and Mechanical
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Hale & Kullgren, Inc., Akron, Ohio

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio

REEL AND TENSION STANDS—
Davis Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Providence, R. I.
Fidelity Machine Company, Inc., Philadelphia.
Industrial Ovens, Inc., Cleveland, Ohio
Kilmer, M. D., & Co., Cleveland, Ohio
Roll-A-Reel, Cincinnati, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

REEL CRUTCHES—
Roll-A-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Canada Reels, Ltd., Bury, Que., Canada
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
North Anson Reel Co., No. Anson, Me.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Co., Garrett, Ind.
Lavendier, Charles, Co., Inc., Pawtucket, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Winchester Reel Co., Ashuelot, N. H.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Canada Reels, Ltd., Bury, Que., Canada
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Ind.
Lavendier, Charles, Co., Inc., Pawtucket, R. I.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
North Anson Reel Co., No. Anson, Me.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Winchester Reel Co., Ashuelot, N. H.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Canada Reels, Ltd., Bury, Que., Canada
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co., Pine River Minn.
Hubbard Spool Co., Garrett, Ind.
Lavendier, Charles, Co., Inc., Pawtucket, R. I.
North Anson Reel Co., No. Anson, Me.
Winchester Reel Co., Ashuelot, N. H.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—(See Ovens—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Indiana
Gerber, J., & Co., Inc., New York, N. Y.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Company, Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUBBERS—for Wire Insulation
Naugatuck Chemical Division of United States Rubber, Naugatuck, Conn.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SALTS—Heat Treating, Descaling, etc.
Holden, A. F., Co., The, Detroit, Mich.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See Compounds—Wire Drawing)

SODIUM—for Descaling
Holden, A. F., Co., The, Detroit, Mich.

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Nukem Products Corporation, Buffalo, N. Y.

TESTERS — INSULATION (See MACHINERY—Spark Testers)

TESTING EQUIPMENT (See MACHINERY Testing, Physical and Diameter Testing)

TINNING PROCESS—
Metal & Thermit Corp., New York, N. Y.

TINSEL—Electric Conductor
Montgomery Co., The Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc. (See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Pressed Steel Div., Republic Steel Corp., Niles, Ohio
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

TUBE BENDERS AND FORMERS—
Kilmer, M. D., & Co., Cleveland, Ohio

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—for Electric Wire
N. E. Lacquer Co., E. Providence, R. I.
Solar Varnish Corporation, Linden, N. J.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Malin & Co., The, Cleveland, Ohio
Seneca Wire & Manufacturing Co., Fostoria, O.

WIRE—Barbed
Gerber, J., & Co., Inc., New York, N. Y.
Interlocking Fence Co., Morton, Ill.

WIRE—Brass
Chase Brass & Copper Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—Brush
Gerber, J., & Co., Inc., New York, N. Y.
Spencer Wire Corp., Union, N. J.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Gerber, J., & Co., Inc., New York, N. Y.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Seneca Wire & Manufacturing Co., Fostoria, O.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
Gerber, J., & Co., Inc., New York, N. Y.
Spencer Wire Corp., Union, N. J.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Gerber, J., & Co., Inc., New York, N. Y.
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Forming
Pittsburgh Cut Wire Co., Pittsburgh, Pa.

WIRE—Galvanized
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Gerber, J., & Co., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Continental Steel Corp., Kokomo, Ind.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Gerber, J., & Co., New York, N. Y.
Johnson Steel & Wire Co., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
North American Philips Co., Inc., Elmet Division, Lewiston, Me.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Seneca Wire & Manufacturing Co., Fostoria, O.
Spencer Wire Corp., Union, N. J.
U. S. Steel Co., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
Seneca Wire & Manufacturing Co., Fostoria, O.
Spencer Wire Corp., Union, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio

WIRE—Oil Tempered
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Special Shapes
Charter Wire, Inc., Milwaukee, Wisc.
Continental Steel Corp., Kokomo, Ind.
National Lock Washer Company, The, Newark, N. J.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Gerber, J., & Co., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Seneca Wire & Mfg. Co., Fostoria, Ohio
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Gerber, J., & Co., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Seneca Wire & Mfg. Co., Fostoria, Ohio
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., Elmet Division, Lewiston, Me.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WRAPPING PAPER—Creped (See PAPER—Creped Wrapping)

YARNS & TAPES—
Belding Heminway, New York, N. Y.
Glass Fibers, Inc., Toledo, Ohio

YARN TESTERS—
Celanese Corporation of America, New York, N. Y.
Heineman Corp., Oscar, Chicago, Ill.
Scott Testers, Inc., Providence, R. I.

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Peterborough, Ont., Canada

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Kaiser Aluminum & Chemical Corp.
Spokane, Wash.

MYER, C. RANDOLPH, Mgr. Abrasives Div.
Elgin National Watch Co.
Elgin, Ill.

NICHOLS, FRANK R., Pres.
Nichols Wire & Aluminum Co.
Davenport, Iowa

OGDEN, DANIEL S., Asst. Sales Mgr.
Continuous Metalcast Co. Inc.
New York, N. Y.

OLIVER, ROBERT E., Mgr. Commercial Research
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United States Steel Corp.
San Francisco, Calif.

PARKIN, FRED H.
Parkin Chemical Co.
Pittsburgh, Pa.

PECK, ROBERT D., Dist. Eng.
Johns-Manville Sales Corp.
Industrial Products Div.
Boston, Mass.

RENNEN, KARL, VDI
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ROSENBERG, SAMUEL J.
National Bureau of Standards
Washington, D. C.

SALZ, LEON, Mgr.
Lubricants Div.
Magnus Chemical Co. Inc .
Garwood, N. J.

SANFORD, ALBERT C., Engineering Dept.
Federal Products Corp.
Providence, R. I.

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Rome Cable Corp.
Rome, N. Y.

SCHAUFELBERGER, F. A.
Chemical Construction Corp.
New York, N. Y.

SCHMID, D. M., Vice Pres. & Genl. Mgr.
Alloy Metal Wire Co. Inc.
Prospect Park, Pa.

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Wire and Wire Products
Stamford, Conn.

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Pueblo Works
Colorado Fuel & Iron Corp.
Pueblo, Colo.

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Scientific Laboratory
Ford Motor Company
Dearborn, Mich.

THOMASSEN, L., DR., Prof. Chemical & Metallurgical Eng. Dept.
University of Michigan
Ann Arbor, Mich.

TYLER, E. S., Metallurgist
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Branford, Conn.

VITELLI, VITO J., Process Engineer
Metallurgical Eng. Dept.
Steel Wire Mills Div.
John A. Roebling's Sons Corp.
Trenton, N. J.

Von KANNEN, ERNST, Chief Engineer
Russ Electric Furnace Co.
New York, N. Y.

WEIL, HERMANN
c/o Draht
Germany

WRIGHT, EUGENE K., Sales Mgr. Mfgrs. Div.
Continental Steel Corp.
Kokomo, Ind.

WURTZELL, F. W., Dev. Eng.
Bakelite Co. Div. of
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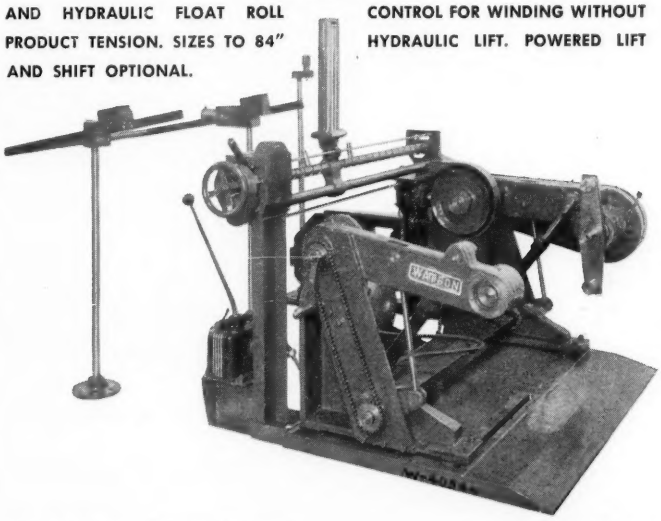

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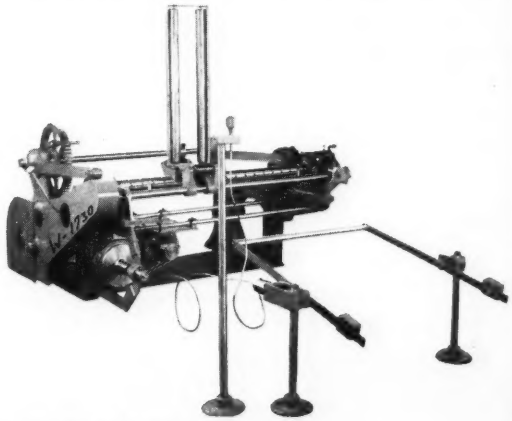

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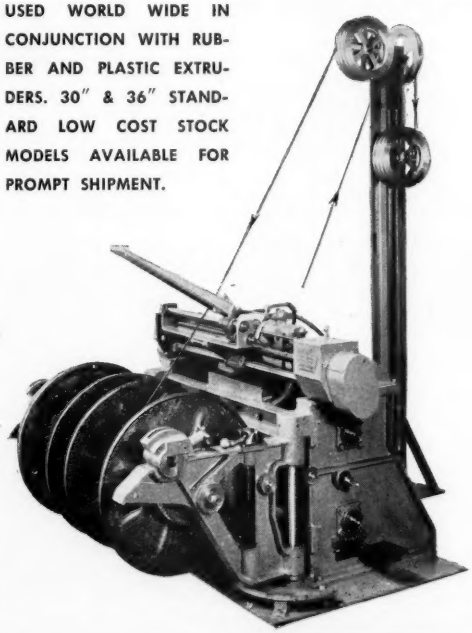
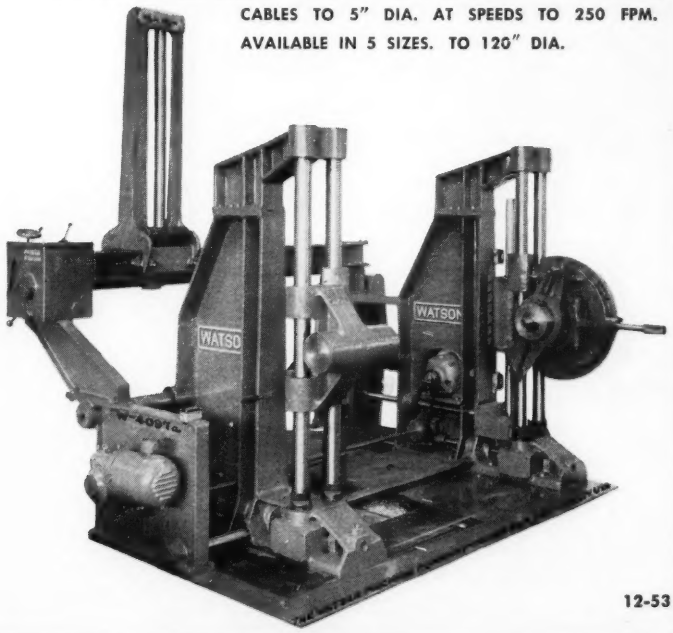
NO. W-1731A IS A 30" & 42" COMBINATION UNIT ARRANGED FOR DUAL REEL CONTINUOUS OPERATION. USED WORLD WIDE IN CONJUNCTION WITH RUBBER AND PLASTIC EXTRUDERS. 30" & 36" STANDARD LOW COST STOCK MODELS AVAILABLE FOR PROMPT SHIPMENT.



TYPE "V" - SHAFTLESS, FULLY MOTORIZED

NO. W-4097A SHOWS A TAKEUP FOR HANDLING REELS FROM 48" TO 110" DIA. HAVING LOADS TO 10 TON, WITH TRAVERSE "WWR." WINDS CABLES TO 5" DIA. AT SPEEDS TO 250 FPM. AVAILABLE IN 5 SIZES. TO 120" DIA.



12-53

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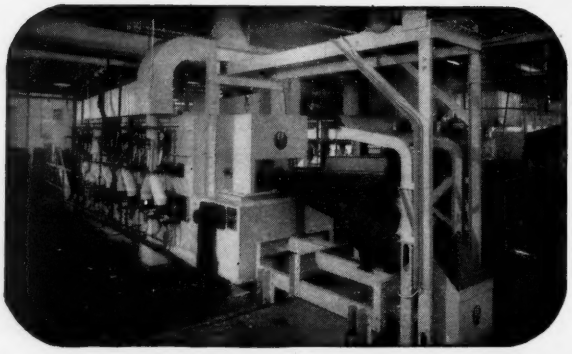
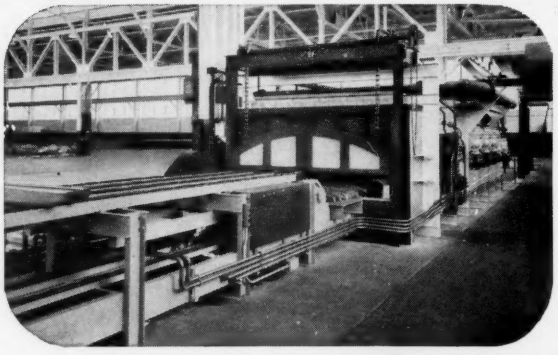
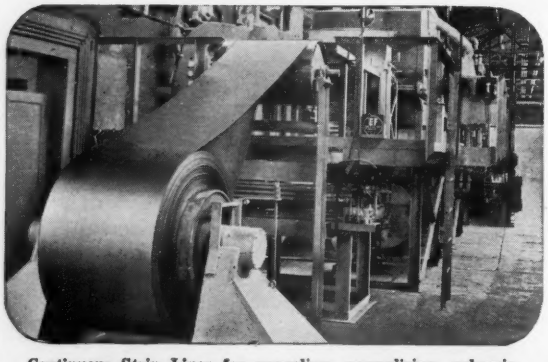


Small parts, headed, drawn, forged or stamped are heat-treated without scale or decarburization—uniformly and economically—in EF chain belt furnaces. Capacities to meet any requirement.



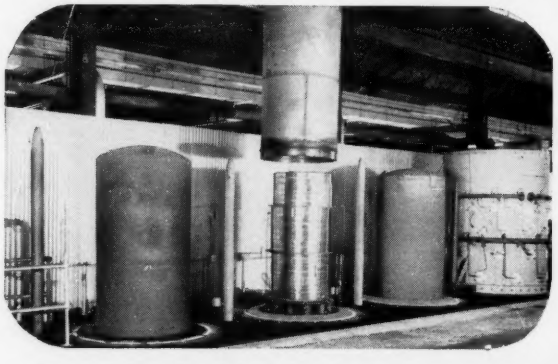
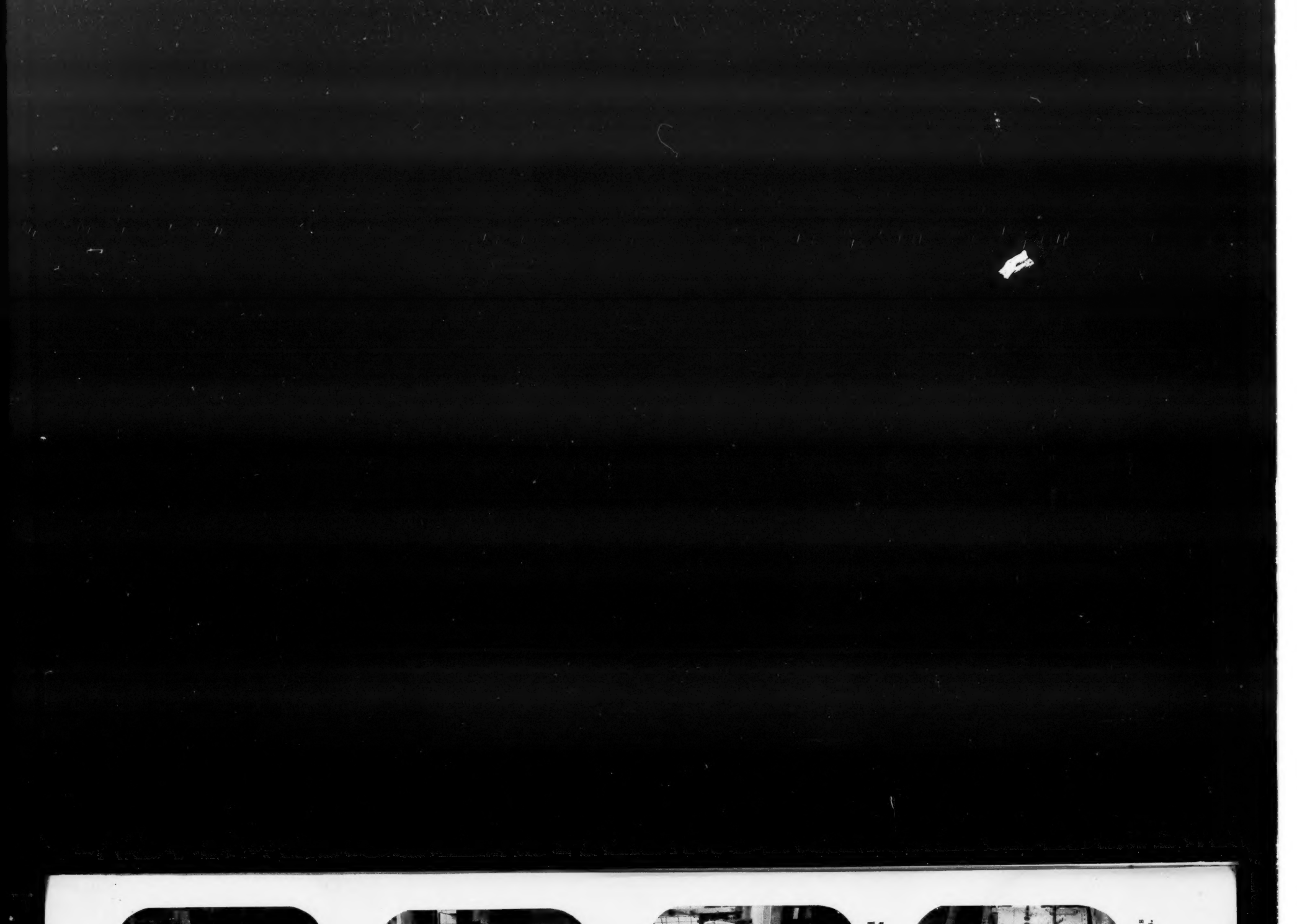
Bars and billets are scale-free heated for rolling, drawing or other processing in EF pusher, rotary and other types of special atmosphere furnaces. Any capacity, atmosphere or temperature.



Continuous Strip Lines for annealing, normalizing, galvanizing, aluminizing and for producing various surface and metallurgical conditions on ferrous and nonferrous strip.

Nickel-silver and other alloy wire and strip is clean and scale-free annealed in EF furnaces. Furnished complete with special atmosphere and desulphurizing units.

Ferrous and non-ferrous wire on reels, spools, coils and strands is bright annealed uniformly and continuously in EF special atmosphere furnaces. Capacities for any requirement.



Carbon, alloy and non-ferrous wire, strip and other products are annealed, carburized or nitrided in EF bell type furnaces. Cycles readily changed to suit the process.